The Electrical Industry's Weekly Magazine September 7, 1959

Electrical World

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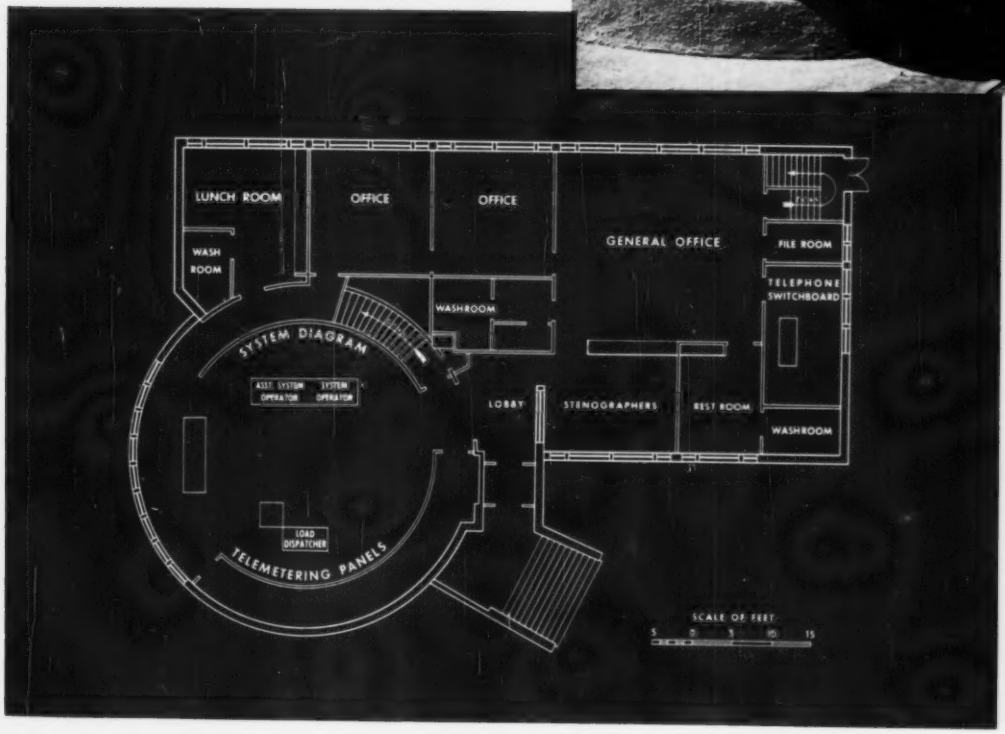
Functional Design Gives Dispatch HQ Round Look...



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TVA's Vogel Talks on Bonds, Foreign Buying ... page 42

UNIV MICROFILMS INC
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A program of advanced study for selected men in the utility industry

General Electric's Power Systems Engineering Course for utility engineers stimulates interchange of ideas on problems affecting the electrical industry.

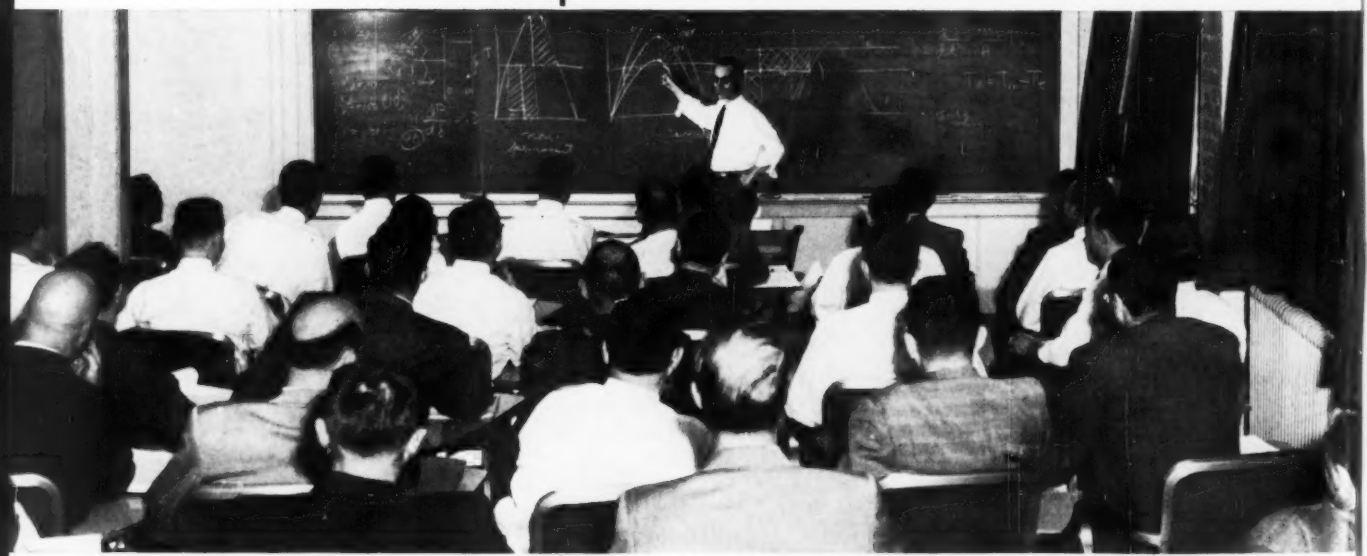
One of the most difficult problems confronting electric utilities today is that of training manpower to keep pace with the changing engineering content of fast-growing utility power systems. Beyond the challenges of expanding generation, transmission and distribution facilities, utilities must plan for innovation—automated steam stations, more sophisticated system interconnections, extra high voltage transmission, nuclear power, trends toward integrated systems. These areas all emphasize the need for better trained technical people.

General Electric recognizes the magnitude of the problem these companies must solve. And as part of its service to the industry, continues to assist utilities in their training activities.

One outstanding example of this G-E service is the Power Systems Engineering Course—a program of advanced study for selected utility engineers. Now beginning its eleventh year, this Course embraces technical phases of power systems engineering, current industry problems, and future system planning. Men selected by utilities themselves take part in an intensive 30-week program, *studying problems related to their own companies*, plus those common to the industry. In addition to classroom work, utility engineers participate in seminars and lectures; study system problems on digital computers and network analyzers; and tour G-E manufacturing plants. Throughout the Course, these men profit by exchanging ideas with G-E engineers and course members from other utilities.

Up to 1959, 210 engineers from outside firms, including 64 utilities, had completed the Power Systems Engineering Course. Graduates return to their companies better equipped to assume greater engineering responsibilities. They are able to pass on this new-found information to their associates; they have made themselves more valuable to their companies and the industry.

Programs like this represent another part of the G-E *Added Value* package made available to purchasers of electrical apparatus . . . Added Values that pay off for General Electric, utilities, and the customers they both serve. 301-409



POWER SYSTEMS ENGINEERING COURSE participant contributes directly to his company's engineering activity by working on immediate or long-range problems related to his system. Graduates multiply program's effectiveness by passing on Program information to others.

MORE POWER TO AMERICA

GENERAL ELECTRIC

Electrical World

Vol. 152, No. 10 SEPTEMBER 7, 1959

Published for 85 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

In This Week's Issue

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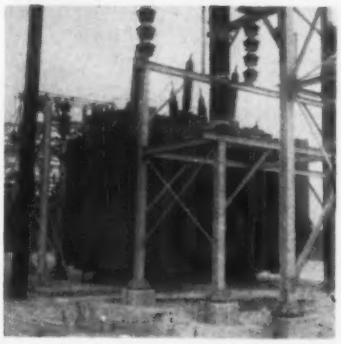

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After five years as board chairman, he describes bonds and foreign purchases in an exclusive interview.....p 42

SUBSTATIONS

Lower BIL Reduces Transformer Cost and Losses

A. C. Kemppainen, Northern States Power Co, H. Fossum, Pioneer Service & Engineering Co, and L. W. Schoenig, Allis-Chalmers Mfg Co

Three-phase autotransformer has 550-kv BIL on 161-kv level and 450 kv on 115-kv level.....p 48

SYSTEM OPERATION

Operating Center Has Functional Design

R. F. Brooks, Shawinigan Water & Power Co

Layout of new building makes maximum use of space to house communication and telemetering equipment.....p 50

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Shut-down Old Units to Cut Operating Costs

C. J. Baldwin, Westinghouse Electric Corp, and R. F. Dittrich, Public Service Electric & Gas Co

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Developing 'Industry From Within' Takes Hold

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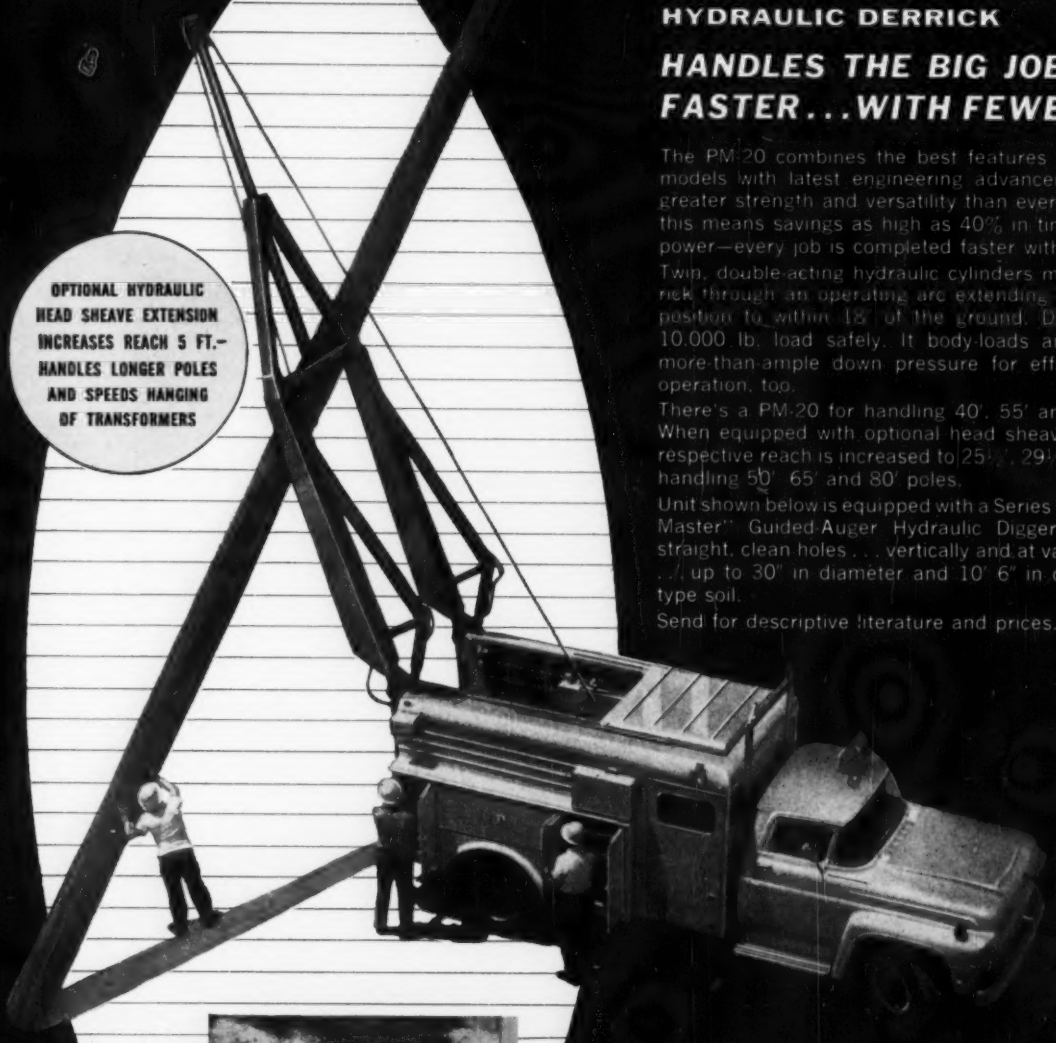

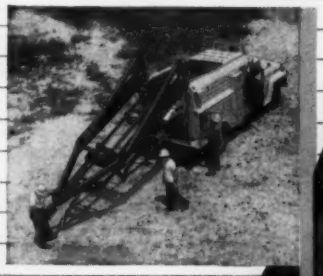

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LETTERS

"Battery"-Powered Mower Seen

To the Editor:

Correspondent L. Baldwin of Waterloo, Australia, inquired (EW, August 10, 1959) about a battery driven lawn mower. It has been predicted. National Carbon Company news release dated September 20, 1957 ("Electricity From Gas Now Practical, National Carbon Discloses") describes research on their fuel cell, and in the final paragraph says "The fuel cell holds great promise for the future, and the day may well come when such common devices as lawn mowers, outboard motors, and even small cars will silently be propelled by the power output of fuel cells."

Yours very sincerely,
Walter J. Seeley, Dean

Duke University
College of Engineering
Durham, North Carolina

But a fuel-cell power pack, though an electricity producer, wouldn't be a "battery," in the usual sense. Stored energy would be in fuel tanks, like a combustion engine's. And there'd be no charging load for the utility.

Subject Was Pipe-Type Cables

To the Editor:

The wording of a reference on the April 27 Executive Reader page to a paper presented at the March PCEA Conference at Long Beach, Calif. by H. H. deLaneux and R. O. Dean of Pacific Gas and Electric Co, and the fact that the title of the paper was not stated, evidently has caused some misunderstanding.

We have received inquiries from companies in the U. S. and Canada which indicate belief that the paper deals primarily with ground networks and their destruction. The title of the paper is "Corrosion Mitigation of Pipe Type Cables", and damage to station ground networks is mentioned only as possible under some conditions.

To correct misinterpretations, we suggest this statement: Copper ground networks may be imperiled and accelerated destruction occur if the network serves as an anode for relatively large-magnitude protection currents, since copper may go into solution at the annual rate of 46 lb per amp.

F. G. Rothganger
Chief, Bureau of Tests and Inspection
Pacific Gas & Electric Co
Emeryville, Calif.

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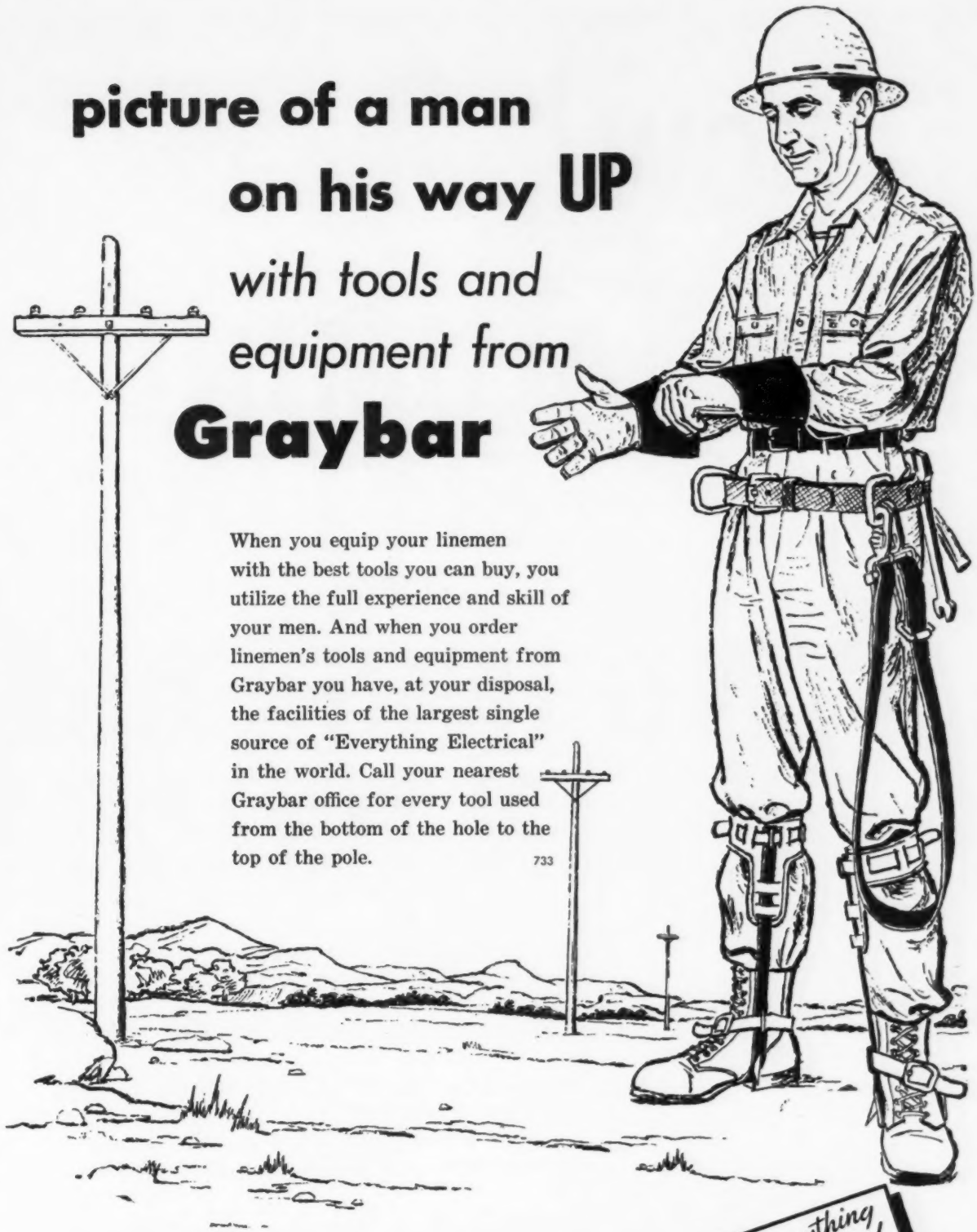

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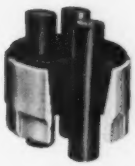
CABLE SUPPORTS

TYPE "S"

TYPE "R"



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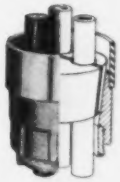

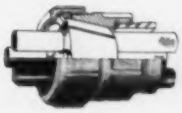

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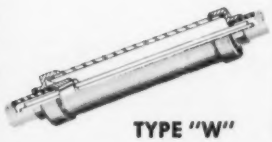

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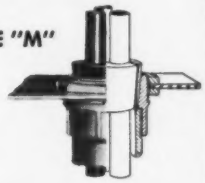
TYPE "M"

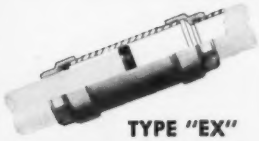


BUSHINGS

TYPE "B"

TYPE "SB"

EXPANSION FITTINGS



TYPE "EX"

TYPE "AX"

TYPE "EXE"

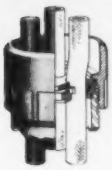
TYPE "DX"

Patented

CABLE TERMINATORS

TYPE "FR"

COMPOUND BUSHINGS

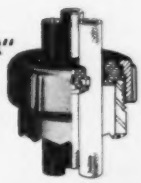


TYPE "DTC"

WITH TAPING CONES

TYPE "KR"

SEALING BUSHING

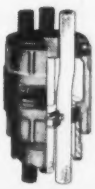


TYPE "CRH"

HORIZONTAL TERMINATOR

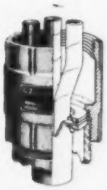
TYPE "CRC"

WITH TOP COVER



TYPE "CLN"

WITH TOP THREAD



PULL BOX FITTINGS

TYPE "PB"

NON-WEATHERTIGHT

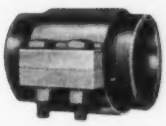
TYPE "PBW"

WEATHERTIGHT

END FITTINGS

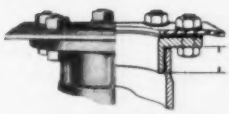
TYPE "E"

SPLIT COUPLINGS



TYPE "SP"

FLANGES



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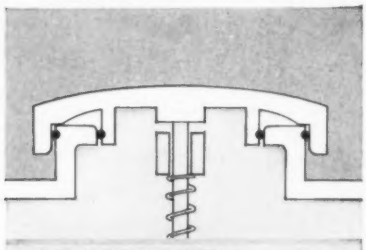
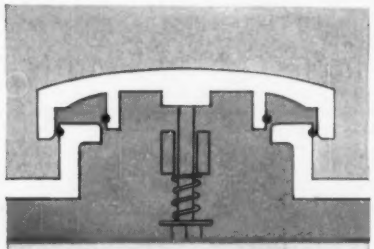
Another Pennsylvania FIRST Ends Transformer Pressure Worries

Automatic Pressure-Relief Device Available as Standard Equipment

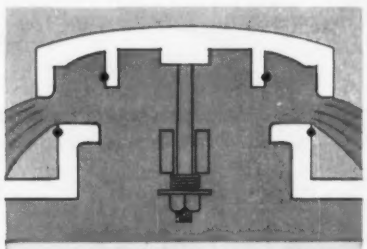
By JOHN KOEPKE
Mechanical Engineer



HERE'S HOW IT WORKS:
1. Pressure-relief device remains closed with normal pressure in the transformer.



2. Overpressure breaks the inside seal . . . extending the pressure area to the outside seal, and accelerating opening.



3. Device is fully open and exhausting gas.

WHY A PRESSURE-RELIEF DEVICE?

Uncontrolled pressures are a potential source of trouble in everything from cooking pots to jet airplanes. Down through the years many kinds of diaphragms and non-resetting relief devices have been used to get rid of potentially dangerous pressures in transformers. None was entirely satisfactory. Diaphragms required replacement. Other relief mechanisms had to be reset. With some designs no one knew for certain at what exact pressure the device would operate. In addition, *all* of the non-resealing mechanisms left the transformer open to possible contamination.

With these problems in mind, Pennsylvania Transformer engineers set out to develop a design so basically simple and yet so dependable that it could be counted on to open *and* close *automatically* whenever needed—whether at frequent intervals or after many years.

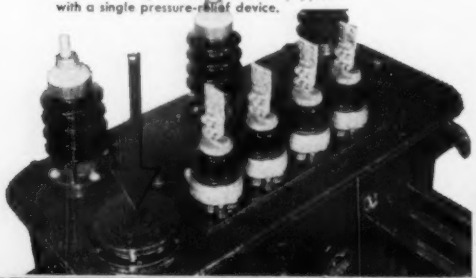
TESTS TOLD THE STORY

Since relief of sudden high pressures requires fast opening to a large exhaust area, the Pennsylvania design was proof-tested in a high-pressure tank using gas explosions with controlled rates of rise varying from 50 to *3080* psi per second. Even with a relatively low rate of rise, less than 300 psi per second, it took only eight thousandths of a second for the relief valve to fully open after the preset pressure was reached. Other tests revealed that it is the total size of the exhaust area that primarily controls maximum internal pressure. *This area in the Pennsylvania relief*

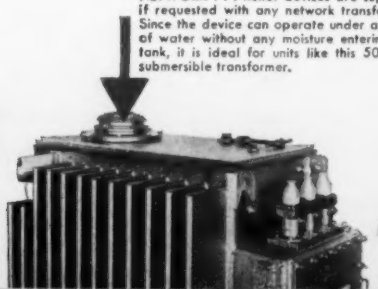
PENNSYLVANIA TRANSFORMERS

PENNSYLVANIA

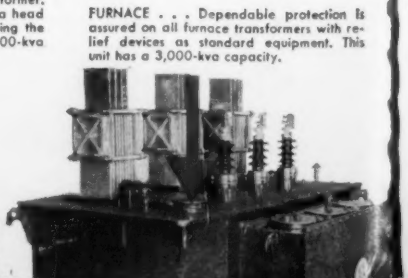
SMALL POWER . . . Small power transformers like this 1,000-kva unit are equipped with a single pressure-relief device.

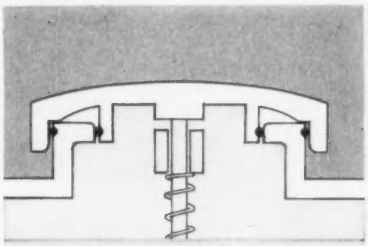


NETWORK . . . Relief devices are supplied if requested with any network transformer. Since the device can operate under a head of water without any moisture entering the tank, it is ideal for units like this 500-kva submersible transformer.



FURNACE . . . Dependable protection is assured on all furnace transformers with relief devices as standard equipment. This unit has a 3,000-kva capacity.





4. Valve is reclosed against positive pressure.

device is substantially larger than that of competitive designs.

BOOSTER ACTION HELPS DO THE JOB

When operation occurs, pressure first breaks the main inner seal by moving the valve head only five percent of its total stroke. The area to the outer seal is then exposed to pressure, doubling the opening force and resulting in an extra accelerating kick.

Closure of the relief device occurs automatically before any air is sucked into the transformer where it could produce a secondary explosion. A powerful spring overcomes the force of the gas being exhausted from the tank and reseals the cover while a low gas pressure remains inside the tank.

SURE TRIGGERING ESSENTIAL FOR DEPENDABLE OPERATION

Every Pennsylvania pressure-relief valve will operate within one-half psi of its calibrated setting. Pressure variations due to load changes in the transformer cannot prematurely trigger the device. Operation is controlled solely by a compressed spring held by a nut which is riveted to the shaft at the proper setting. This setting cannot be readily tampered with, and should the relief device be dismantled in the field, the design assures that it will be returned to the correct setting.

FOR SIMPLICITY: JUST TWO MOVING PARTS

Consistent operation *without attention* is assured by an inner pressure seal—an "O"-ring silicone gasket—under radial pressure against a permanently lubricated surface. Manufacturing tolerances are easily controlled to assure proper gasket pressure each time for perfect sealing. Designed with only two moving parts, the device is of simple, rugged construction with every part—aluminum housing, stainless steel shaft, and silicone "O"-ring gaskets—selected for minimum maintenance.

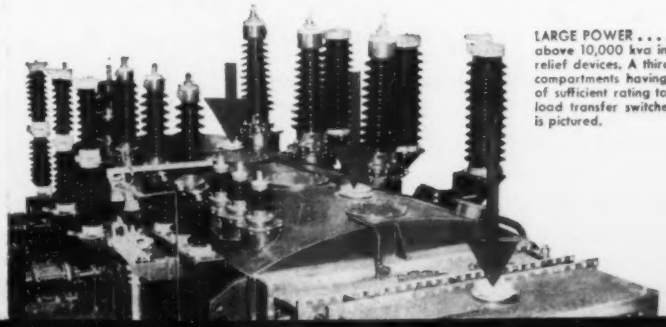
Optional extras include alarm contacts and a visual operation indicator easily reset from the ground.

* * *

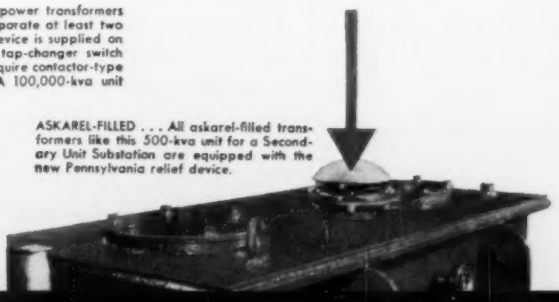
Our newly introduced Pennsylvania Transformer relief device is now available as *standard equipment* on Pennsylvania Transformers. Additional information is available on request from Power Sales Department, Pennsylvania Transformer Division, McGraw-Edison Company, Canonsburg, Pennsylvania.

McGRAW-EDISON

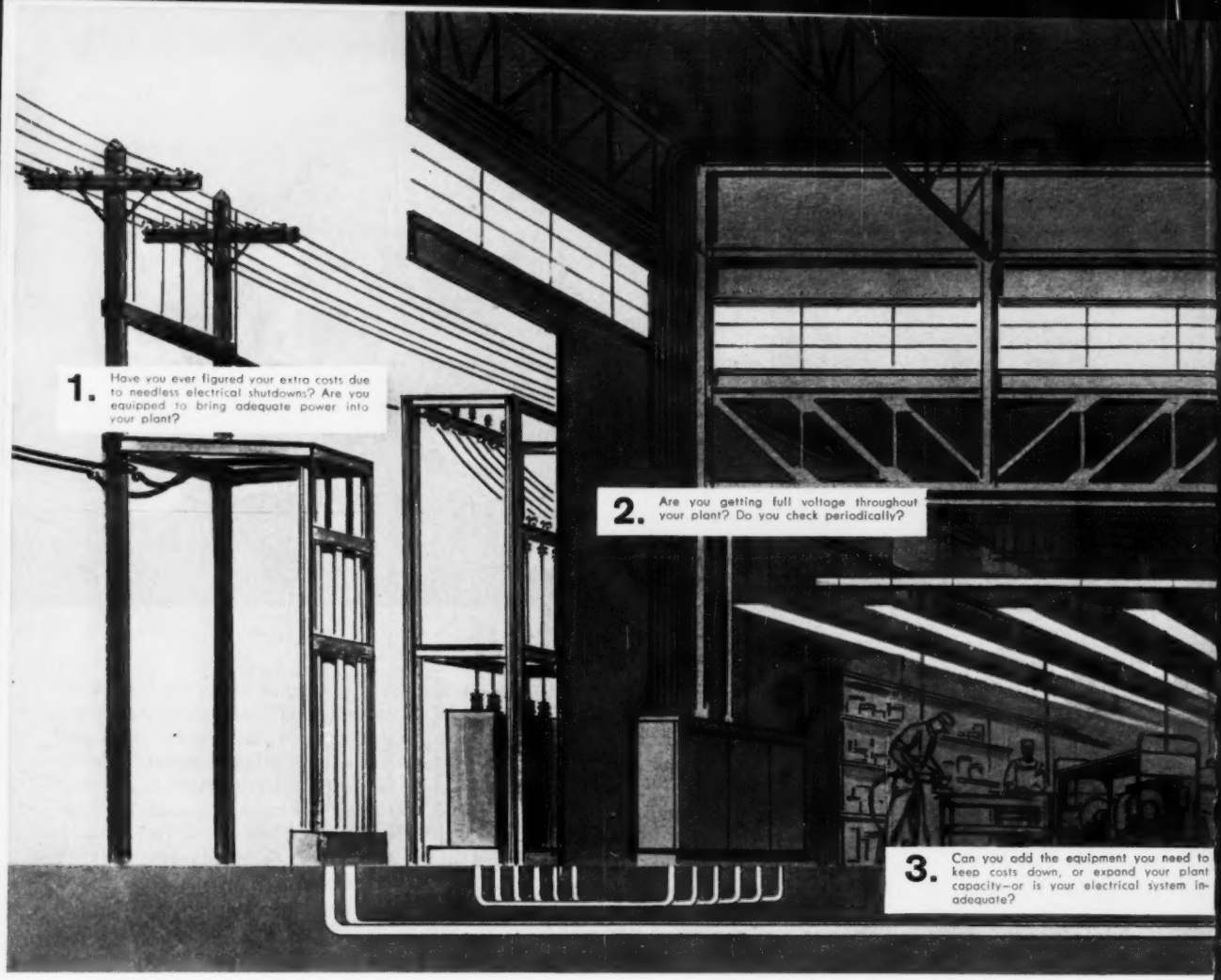
POWER TRANSFORMERS



LARGE POWER . . . All power transformers above 10,000 kva incorporate at least two relief devices. A third device is supplied on compartments having a tap-changer switch of sufficient rating to require contactor-type load transfer switches. A 100,000-kva unit is pictured.



ASKAREL-FILLED . . . All askarel-filled transformers like this 500-kva unit for a Secondary Unit Substation are equipped with the new Pennsylvania relief device.


1. Have you ever figured your extra costs due to needless electrical shutdowns? Are you equipped to bring adequate power into your plant?
2. Are you getting full voltage throughout your plant? Do you check periodically?
3. Can you add the equipment you need to keep costs down, or expand your plant capacity—or is your electrical system inadequate?

HOW MUCH CAN A HIGH-VOLTAGE CABLE SYSTEM SAVE YOU?

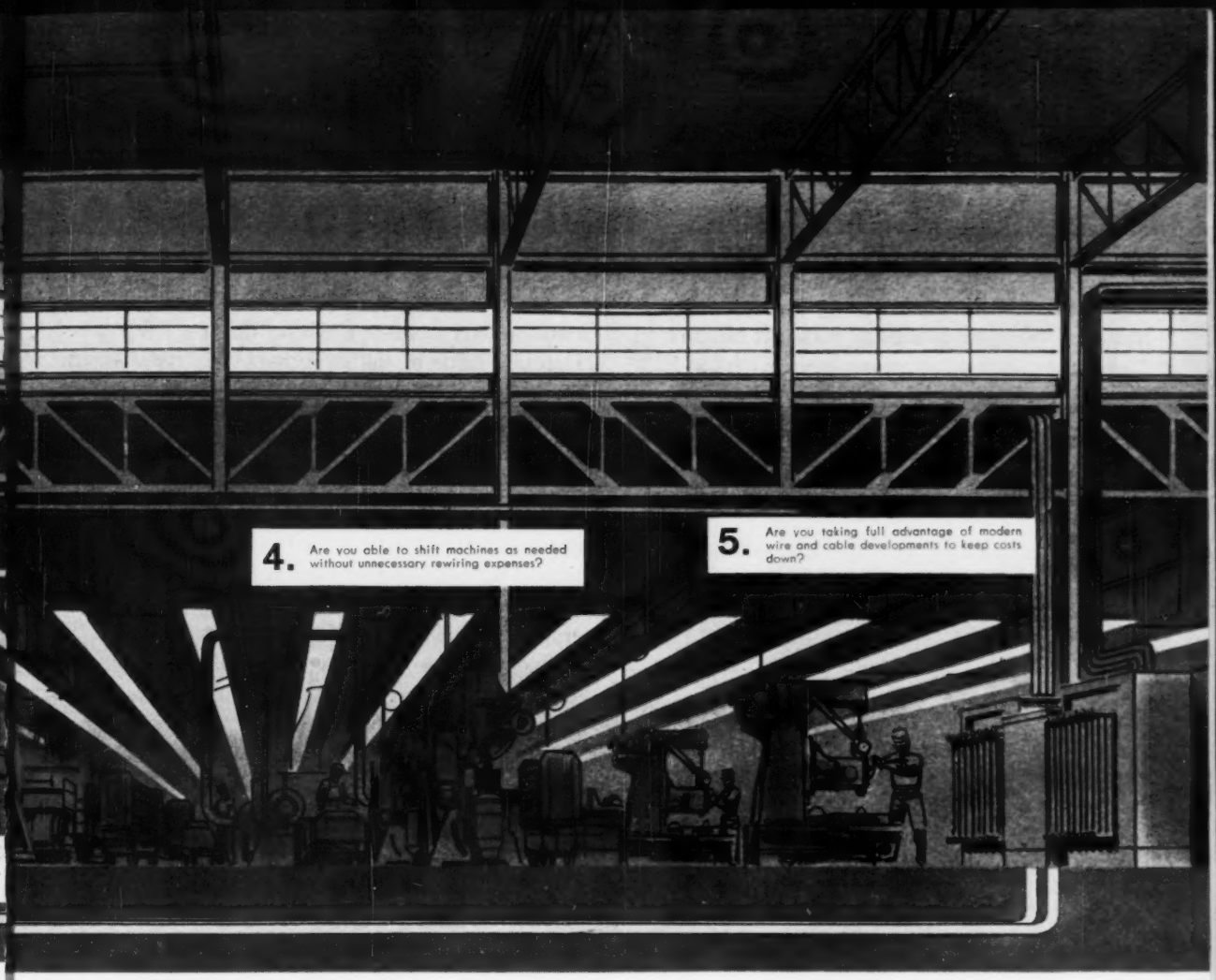
These 5 questions may lead you to some important cost reductions. And Anaconda technical specialists are available to help you get the answers.

1. Have you ever figured your extra costs due to needless electrical shutdowns?

These extra costs can be: lost production time, cost of labor standing by while repairs are made, damage to goods in process, loss of business due to delayed delivery, cost of repairs themselves. Such shutdowns can be caused by overloaded circuits, poor quality or overaged cable, or inadequate protection against nonelectrical hazards such as chemical fumes, atmospheric conditions, mechanical damage. Your electrical department, your electrical contractor or the Man from Anaconda can help you avoid these costly shutdowns by recommending proper cable for your present or future electrical system.

2. Are you getting full voltage throughout your plant? Do you check periodically?

Low-voltage conditions in your plant can bring about reduced production, excess current consumption, failures of motors from overloading. It can even prevent the use of all your machines at the same time. That's why it is important to bring power into your plant at sufficiently high voltage to service present *and* anticipate


4. Are you able to shift machines as needed without unnecessary rewiring expenses?
5. Are you taking full advantage of modern wire and cable developments to keep costs down?

requirements. Dependable cable, of course, is of the utmost importance – the cable produced by Anaconda and discussed on the following two pages.

3. Can you add the equipment you need to keep costs down, or expand your plant capacity – or is your electrical system inadequate?

Inadequate cable capacity in your plant results in *excessive* power loss caused by increased voltage drop. Not only are you paying for *wasted* power, but your electrical system is incapable of handling modern cost-saving equipment. *Efficiency* is down and so are profits.

4. Are you able to shift machines as needed without unnecessary rewiring expenses?

Plant inflexibility can strangle both growth and efficient operation. Plants wired in rigid conduit, for example, often make the shifting of machinery slow and expensive. Cables such as Anaconda butyl-insulated Duralox,* with its *built-in* interlocked armor, and flexible Anaconda Powerduct Cable eliminate such expensive rewiring when equipment must be moved – save you time, money, labor and permit cost-saving freedom in the arrangement of your machinery. You'll find further details about them on the following pages.

5. Are you taking full advantage of modern wire and cable developments to keep costs down?

Thorough inspection of your plant's electrical system, talks with your electrical engineers, qualified electrical contractors or the Man from Anaconda can show you where you are needlessly losing money. Once you discover these profit-robbing problems, Anaconda stands ready to help you do away with them – with an outstanding range of quality wires and cables for every electrical need . . . to permit you to concentrate on production with the assurance that your electrical system is the most efficient, most economical possible.

*Reg. U.S. Pat. Off.

Please turn page for more information.

ANACONDA WIRE & CABLE COMPANY
25 Broadway, New York 4, N. Y.

HOW MANAGEMENT CAN REDUCE HIDDEN ELECTRICAL COSTS WITH ANACONDA BUTYL-INSULATED, "PRECISION-BUILT" HIGH-VOLTAGE CABLE.

Management in the past has left electrical problems to electrical people—but has not always provided them enough money to do an adequate job. Result: poor performance... high costs!

A little goes a long way—especially when it's the *little extra* invested in your electrical system which will save you costs of cable failures, machine shutdowns, high maintenance, lost production.

The previous page has indicated why management should take an active interest in electrical systems . . . it has *shown how* and *where* inadequate wiring eats into your profits. Now, without being technical, let's look at *what* can be done about it . . . how new Anaconda products can make a significant contribution to your profit picture.

THE WORLD OF MODERN WIRING has made outstanding advances—and within the last few years. Here are some of the more important ones. Read them over *in light of changes that have probably taken place in your plant since the original wiring was installed.*

NEW HIGHER VOLTAGES. Many electrical problems in plants today can be traced to low-voltage conditions. That's why higher plant voltages—with resulting increased efficiency—deserve primary consideration. A few years ago, high voltages posed a problem: ozone, a by-product of high-voltage operation, destroyed ordinary insulation, causing premature cable failure. Anaconda engineers have solved this problem with pioneering work in new *butyl-rubber* insulations. (See below.) There is a high-voltage Anaconda cable to fit every plant need: corrosion-resistant Durasheath,* Duralox Interlocked Cable that needs no conduit, and easily installed weather-resistant Anaconda Aerial Cable.

*Reg. U.S. Pat. Off.

TESTS... SERVICE RECORDS—THEY ALL PROVE

Anaconda Butyl (AB) Rubber Insulated High-Voltage Cable gives you more amps per dollar

Anaconda Butyl (AB) insulation gives performance far beyond industry specification standards — in *every* important electrical and physical property. Butyl rubber has inherent high resistance to ozone, heat and moisture. Thus, compounding efforts ordinarily spent to obtain these qualities have been devoted to the development of other desirable properties . . . giving you a cable with *quality throughout.*

To provide added assurance of peak performance, Anaconda manufactures its butyl-insulated high-voltage cable under controlled conditions on the most modern equipment, subjects it to rigorous tests. These tests have proved conclusively Anaconda Butyl (AB) has greater resistance to ozone than any other known rubber insulation. The real proof, however, is the service records of the millions of feet of Anaconda butyl-insulated high-voltage cables giving years of dependable superior service to utilities and industrials.

This advertisement can, of course, provide only a few examples of how modern Anaconda wires and cables are helping industry achieve more efficient production . . . reach full power for full profit. Your own electrical department, your qualified electrical contractor, consulting engineer or the Man from Anaconda can give you personal and expert assistance with the wiring needs of your plant.

59238

ANACONDA® WIRE &

25 BROADWAY,

NEW CABLE HAZARDS. Chemicals, moisture, oils – natural to most modern plants – are tough on cable. Engineers at Anaconda have come up with an answer: Durasheath, made with Anaconda Butyl (AB) insulation and specially compounded neoprene jacket – a superior product for low and high voltages. This rugged cable resists almost every enemy of cable life. And it is versatile. You can use it throughout your plant – aerially, in ducts, buried directly in the ground. It reduces down-time, maintenance and replacement costs. In addition to Durasheath, Anaconda offers the following cables with the same outstanding resistance qualities: Duralox Interlocked Cable, Aerial Cable, Densheath 900 industrial wire, all-purpose 20-10 thermoplastic control cable.

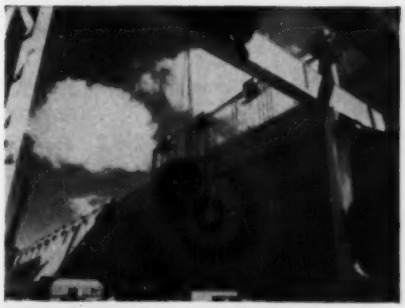
NEW OPERATING CONDITIONS. These have put new demands upon wiring. Higher loads generate more heat in cable . . . and more heat in cable, whether installed underground or in other moist locations, can destroy cable insulation. Today, Anaconda Butyl (AB) rubber insulation, used on many Anaconda rubber power cables, does the job withstanding *heat* and *moisture* at higher operating temperatures.

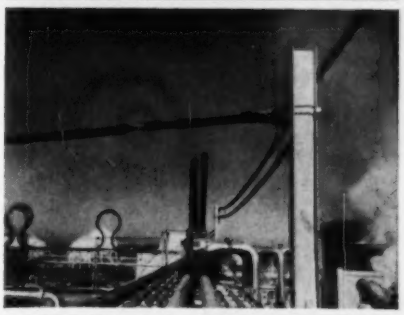
NEW EQUIPMENT. The introduction into plants of process-heating equipment, process or comfort air conditioning, and new production machines calls for new wiring to carry the increased load. Anaconda Interlocked-Armor Cable can be installed up to 40% quicker than many other types of cable because it needs no conduit. You save time and money when the cable is installed – and later, too, if cable must be moved. This cable is 100% salvageable, it reduces fire hazard . . . can be taken down and used again when plant changes are required.

MODERN BUSWAY SYSTEMS. Anaconda's flexible Powerduct Cable now makes it possible to increase the flexibility of your busways as never before. It just plugs into the busduct . . . and unplugs when you want to move machines. No costly conduit to put up or rip out. You effect important savings in production time and in labor. In addition, Anaconda Powerduct Cable is also 100% salvageable on every move!

NEW POWER. As modern plants find the need of bringing more and more power into their working areas, more and more are choosing Anaconda Aerial Cable. It's a wise, economical choice – especially where the underground area is congested with pipes and other structures, or contains corrosive agents. Anaconda Aerial Cable is easy to install – even between closely spaced buildings where clearance is limited. Anaconda Aerial Cable is neat, safe, reliable, lower in cost than underground systems.

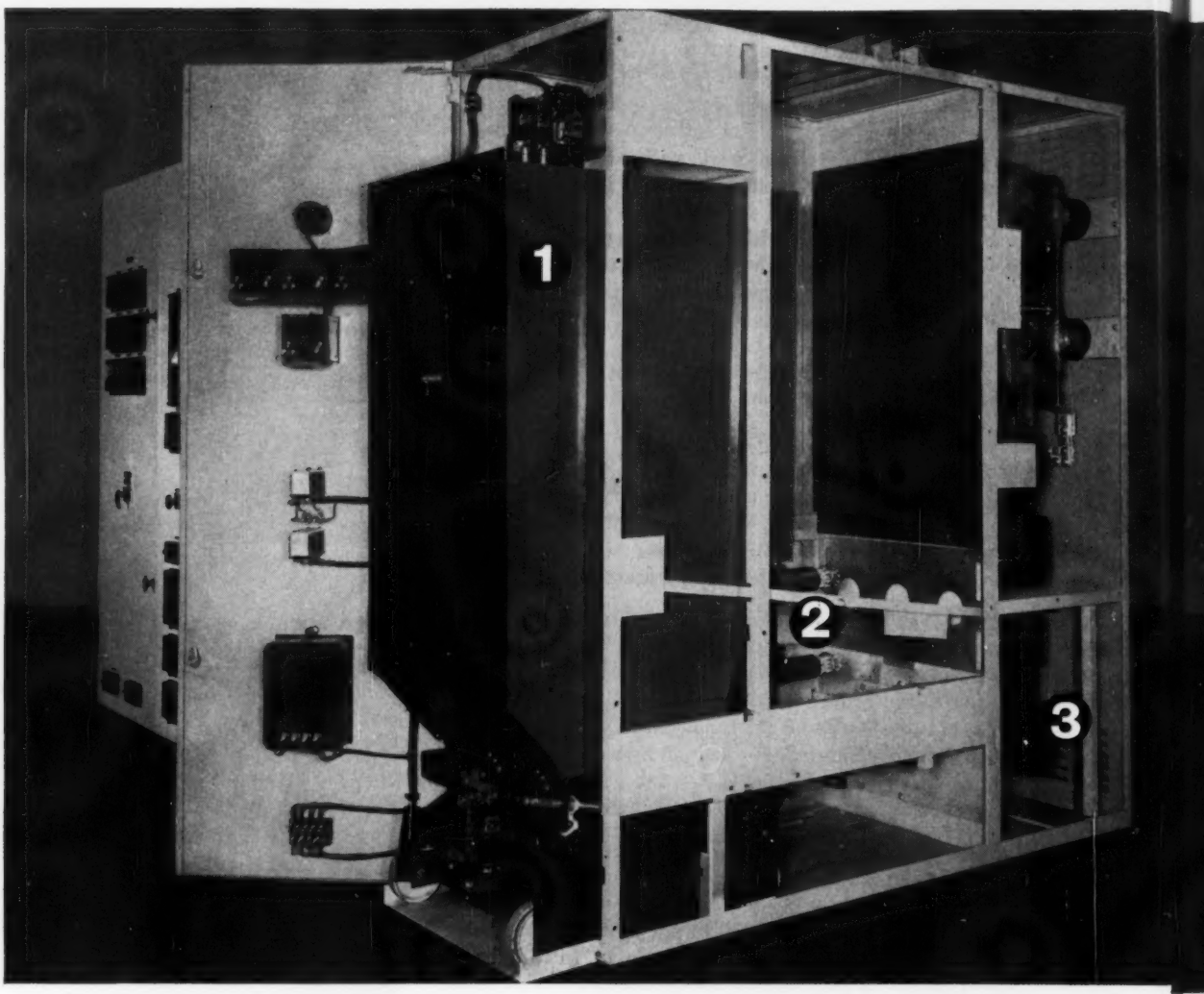
NEW ELECTRICAL EQUIPMENT. The trend to automation and more complex machines puts new emphasis on control cable. Here, again, Anaconda's years of cable experience has paid off in a full and constantly growing line of superior control cables – with modern types of insulations and coverings to give them highest reliability. The most promising control cable development is the all-purpose 20-10 thermoplastic design for 600 volt service (30-15 control cable for 1000 volt service). Anaconda Control Cables – both in rubber and plastic – assure you the most reliable service.





CABLE COMPANY

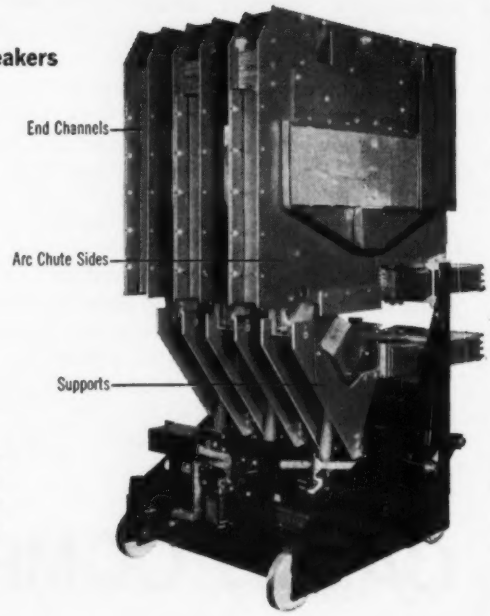
New York 4, New York



1 **"Limitrak" Glass Polyester Insulation on DH Breakers**

2 **"Limitrak" Coating on DH Breaker Bushings**

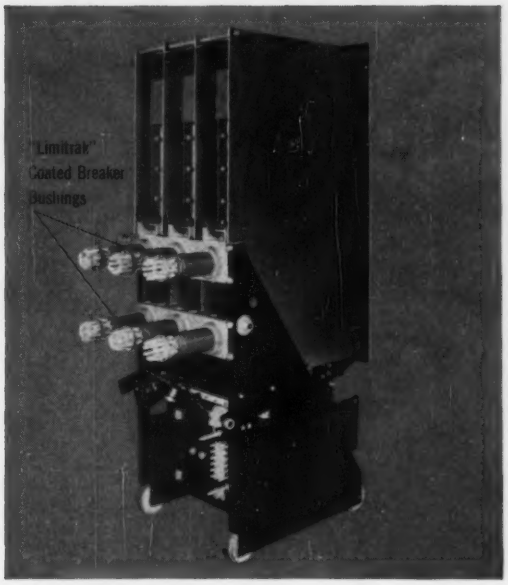
3 **"Limitrak" Design Porcelain Bus Supports**



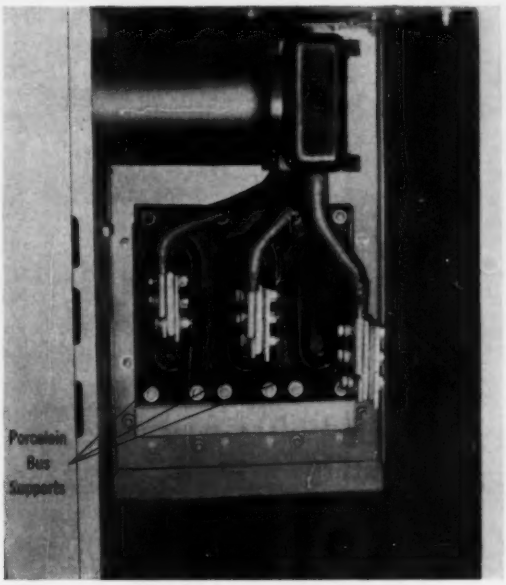
"Limitrak" Glass Polyester Insulation is used for arc chute sides, end channels and supports on DH breakers. Tests have proved it 300 times more track-resistant than ordinary glass polyester materials.

BONUS VALUE BEYOND SPECIFICATION FROM WESTINGHOUSE

"LIMITRAK"–THE EXCLUSIVE NEW WESTINGHOUSE INSULATION . . . provides superior, balanced protection in metal-clad switchgear



"Limitrak" Coating for insulation bonds itself to other basic insulating materials such as phenolic insulation. An exclusive compound developed by Westinghouse, "Limitrak" coating raises the track-resistant characteristics of phenolic materials to a level equivalent to "Limitrak" glass polyester insulation.



"Limitrak" Design provides greater-than-ever track-resistant surfaces on porcelain insulating components. Exclusive "Limitrak" design of this vertical bus support, for example, minimizes accumulation of potentially conductive materials–provides maximum phase-to-phase and phase-to-ground fault protection even in moisture-laden atmospheres.

Westinghouse developments in insulating materials and design are combined in the exclusive new Limitrak® insulation system which offers users a superior, balanced level of protection in Westinghouse metal-clad switchgear.

"Limitrak" Glass Polyester Insulation is a new track-resistant material developed by Westinghouse. It is used for sheet and molded shapes in metal-clad switchgear. Tests have proved "Limitrak" to be 300 times more track resistant than ordinary grades of glass polyester–and 1200 times more track resistant than phenolic material. "Limitrak" is also highly flame retardant.

"Limitrak" Coating for insulation, used on DH breaker bushings, combines the track-resistant characteristics of "Limitrak" materials with the high dielectric strength and characteristics of all Westinghouse bushings. This coating can be applied to carefully cleaned insulation on existing equipment to provide better-than-new resistance to tracking and moisture absorption.

"Limitrak" Design, incorporated in procelain insulation components such as vertical bus supports used in metal-clad cells, provides superior track resistance since this one-piece vertical design eliminates hidden creepage paths.

Get the complete story on the superior, balanced protection you receive in Westinghouse metal-clad switchgear with the exclusive "Limitrak" insulation system. Call your Westinghouse representative.

J-60974

YOU CAN BE SURE...IF IT'S

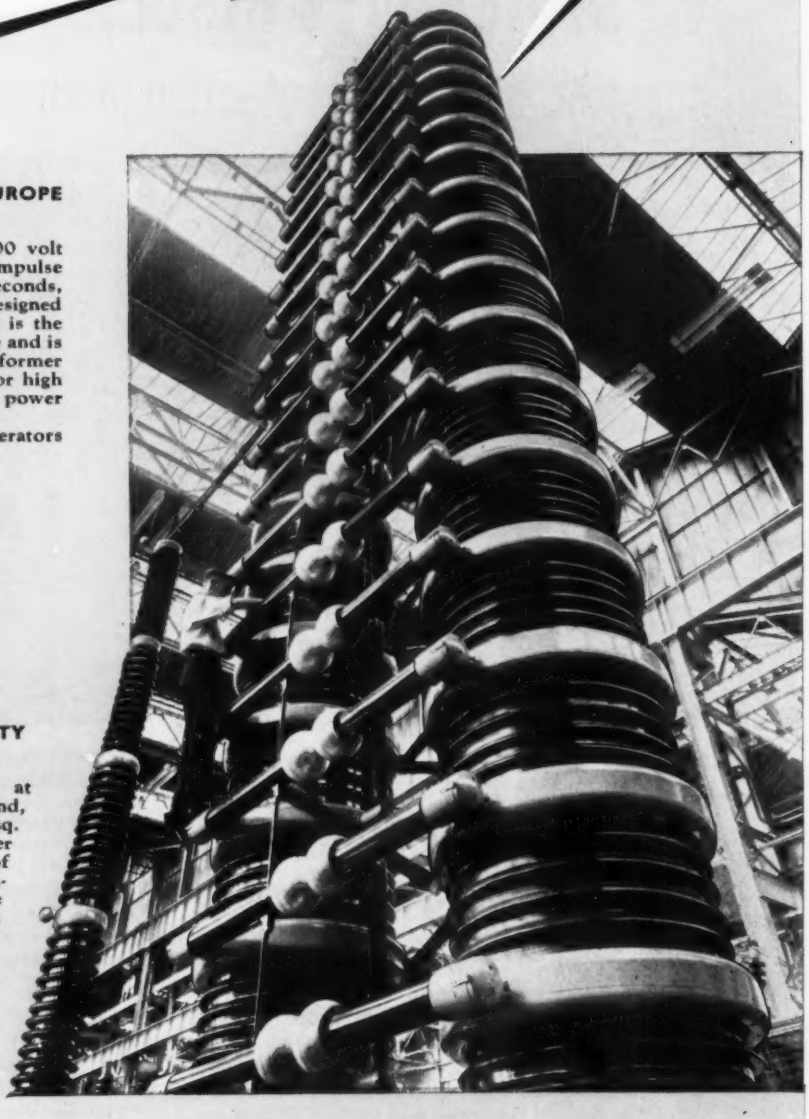
Westinghouse

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV FRIDAYS

4,000,000 VOLTS!

THE LARGEST
IMPULSE GENERATOR IN EUROPE

The illustration shows a 4,000,000 volt 18 stage, 2 column Ferranti Impulse Generator, energy rating 285 kW seconds, D.C. charging 220 kV per stage. Designed and built by Ferranti engineers, it is the largest impulse generator in Europe and is now installed in the Ferranti Transformer Factory at Hollinwood, England for high voltage impulse testing of large power transformers.
Ferranti High Voltage Impulse Generators are used throughout the world.



OVER 5,000,000 kVA
per annum
of TRANSFORMER CAPACITY

The Ferranti transformer plant at Hollinwood, Lancashire, England, covering an area of over 300,000 sq. ft. has a manufacturing capacity per annum of over 5,000,000 kVA of Large Power Transformers, Distribution Transformers, Voltage Regulators, High Voltage A.C. and D.C. Impulse Testing Plant and Specialised Equipment. Contracts include the supply of transformers for the Garrison Dam and McNary Dam Projects in the U.S.A. and the Alcan Project in Canada.

FERRANTI LTD

Head Office and Plant: **HOLLINWOOD · LANCASHIRE · ENGLAND**

OFFICES AND PLANTS

London Office: **KERN HOUSE · 36 KINGSWAY · W.C.2**

NEW YORK: Ferranti Electric Inc., 30 Rockefeller Plaza, N.Y.20

TORONTO & ST. CATHARINES:
Ferranti-Packard Electric Ltd., Ontario, Canada

MOSTON: Manchester 10, England
WYTHENSHAWE: Manchester 22, England
WEST GORTON: Manchester 12, England
GEM MILL: Chadderton, Lancs., England
EDINBURGH: Ferry Road, Edinburgh 5, Scotland
DUNDEE: Kings Cross Road, Dundee, Scotland

FT176/2

The Electrical Week

LATE NEWS ▶ **Washington Wire** . . . Clyde Ellis, NRECA head, and Alexander Radin, APPA manager, appear to have won fight on joining tour of U.S.S.R. power installations . . . Pacific G&E would buy output of hydro projects which two California water groups hope to build: Nevada Irrigation District seeks preliminary FPC permit to study 55-Mw dam on Bear and Middle Yuba rivers, and Calaveras County Water District asks for permit to build 333-Mw Stanislaus project.

New residential heating rates adopted by Dayton P&L, United Illuminating. DP&L charges 1.7¢ a kwhr for anything over 500 kwhr when electricity is sole source. UI sets 2¢ a kwhr space heating rate with $1.50 monthly minimum from October through May.

Output again hits record high. For week ending Aug. 29, sendout hits 14.109 billion kwhr, up 15% over same week last year.

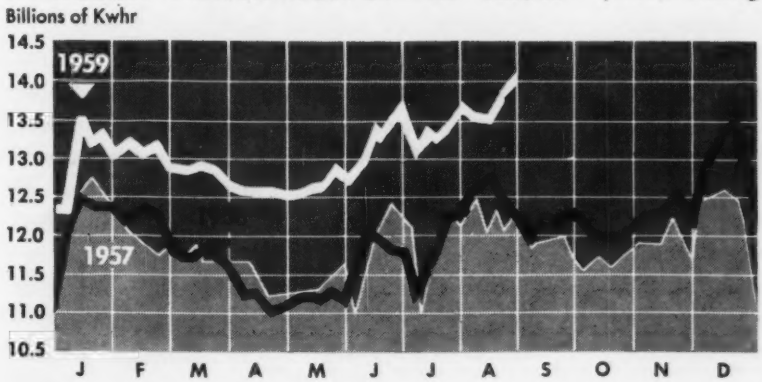
New Live Better Electrically Program manager is Ralph Zeuthen. Former head of Zeuthen, Thomas & Hulbert—a Minneapolis ad agency—he takes on $2.5-million EEI effort which used to be called National Electric Living Program.

Army Engineers bulldoze spillway atop rockslide damming Madison River in race to achieve smooth flow of water, which is expected to overflow by today. Lake formed by 'quake-caused slide totals about 80,000 acre-ft, 7-mi downstream from Montana Power's Hebgen Dam.

Cause of failure on 330-Mva transformer at TVA's Gallatin station Aug. 29 is under study, says supplier English Electric.

Management changes . . . New England Electric System elects R. F. Crause vp . . . New England Power Service names F. R. Joslin vp . . . Burndy elects Marvin Lee president, succeeding Bern Dibner who becomes chairman.

WEEKLY POWER OUTPUT—UP 15.0% (Week ending Aug. 29), Kwhr 14,109,000,000



Per Cent Change From Previous Year

	Aug. 15	Aug. 22	Aug. 29
Total U. S.	+ 6.2	+12.1	+15.0
New Eng.	+ 8.4	+14.8	+10.6
Mid. Atlan.	+ 7.0	+20.6	+19.0
Cent. Ind.	+ 4.0	+12.1	+16.9
West Cent.	− 0.6	+11.6	+23.6
Southeast	+ 5.1	+ 9.2	+14.0
South Cent.	+ 6.8	+ 9.9	+13.9
Rocky Mount.	+ 7.3	+ 5.6	+ 1.8
Pacific			
NW	+15.2	+15.9	+12.2
SW	+11.5	+ 7.9	+ 9.9

Seasonally Adjusted Index 262.1

Week Ago 260.6 Year Ago 227.9

Source: Edison Electric Institute

Preview of this Issue

EVENTS ▶ **TVA-Chief Vogel talks about bond financing, foreign buying,** other current issues in exclusive interview with EW (p 42) . . . House fails in attempt to override President's veto of Public Works Bill (p 45) . . . Work progresses on EHV cable test (p 46) . . . American & Foreign Power cancels bond sale after Cuba slashes rates (p 46) . . . AEC signs contract with Philadelphia Electric, General Dynamics for 40-Mw high-temperature reactor (p 47).

ENGINEERING ▶ **Reduced-insulation transformer at Northern States Power** saves on investment cost and losses, and its impedance is lower (p 48) . . . Shawinigan W&P builds system operating office which accommodates centralized load-frequency control, communications, and telemetering (p 50) . . . Public Service E&G survey shows shutting down unneeded generators during light-load periods saves on production costs, despite start-up expense (p 54) . . . With first-class pole timber on the decline in quantity and quality and no suitable substitute material for wood in sight, a program of pole conservation is a utility company necessity today (p 65).

PROCUREMENT & PRODUCTS ▶ **Penn Transformer announces new distribution transformer finish** . . . Line Material tests a plastic finish . . . More competition here for

Politics and Public Power

BURNS CREEK—A COSTLY 'CHILD'

The proposed federal Burns Creek dam and reservoir on the Snake River in Idaho is an extreme example of an attempt by the government to justify an almost exclusively single-purpose power dam under the guise of reclamation and multi-purpose uses.

It is favored by the Bureau of Reclamation, and both the Senate and House voted funds (in the just-vetoed Public Works Appropriations bill) to start work on Burns Creek. However, only the Senate has authorized the project (S-281), and a last-minute push is being made in the House to pass a companion authorization bill (HR-1235).

Burns Creek dam, capable of generating 90,000 kw, would be integrated with the existing Palisades project 30 mi upstream. Palisades is cited by Burns Creek proponents as the principal reason for construction of Burns Creek. They emphasize the need for river re-regulation below the upstream dam. Likewise, critics cite Palisades as the whipping boy for any financial deficits from Burns Creek.

Higher-cost Burns Creek power would be mixed with lower-cost Palisades power, and apparently sold at one price. If this price drops below Burns Creek's generating costs, then reclamation revenues will be drained away from the joint projects.

Palisades Dam, costing about $65 million, has its construction costs allocated as follows: 37% for flood control, 31% for irrigation, 31% for power and 1% for conservation and recreation, with a generating capacity of about 114,000 kw. Palisades' cost per installed kw is about $269.

Burns Creek, by stark contrast, would cost between $45-$50 million—more than 98% allocated to power. The remaining $850,000

foreign manufacturers . . . Copper and steel inventories good (p 71).

MANUFACTURERS ▶ **EEI's mid-year survey shows 20.8% drop** in electrical equipment order backlog scheduled as of July 1, compared with mid-'58. Total capacity of 29.3 Mw, scheduled as of July 1 by U. S. power systems, is lowest since '55. Only 28% of this is scheduled for shipment in '59, 42% in '60, 23% in '61, and remainder in '62 or later (p 72).

NEW EQUIPMENT ▶ **Bushing type current transformer** slips on over power bushings up to 34.5 kv . . . Extra-high strength insulators are available for switch and bus mounting (p 82).

MANAGEMENT ▶ **Utilities are neglecting industry that's already on the line** while concentrating on bringing in new plants to the area, judging from the views of some area development men. More could be done, they say, to help solve problems that cause industry to seek greener pastures elsewhere. A market analysis aiming for "satellite" industries may be one answer (p 85).

SELLING ▶ **Dial calculator can help utility men answer queries** as to cost of heat pumps as compared with gas or oil heating (p 94).

would be charged to irrigation. And Burns Creek's cost per installed kw would run slightly above $500. Only 17,000 acre-ft of Burns Creek's total reservoir capacity of 234,000 acre-ft would be allocated to irrigation—principally for river re-regulation below Palisades. The rest would be held as long-term storage for "extreme droughts" or as inactive storage.

Sen Barry Goldwater (R-Ariz.) has charged that this project "is another example of using reclamation as a vehicle for promoting public power to the detriment of reclamation. If re-regulation is the major objective (of Burns Creek), it could be obtained by building a dam with only 17,000 acre-ft of storage capacity at a cost of about $6 million." Goldwater added that Burns Creek would force a net reduction of $28 million in surplus irrigation funds from Palisades by the year 2016—that the two projects would not break even until 2015, although by itself, Palisades could be repaid by 1990.

Coal interests, including the United Mine Workers, oppose Burns Creek as cutting into their market to coal-fueled plants in the area. A new steam plant, to be built by Utah Power & Light Co, could be delayed or seriously affected by construction of Burns Creek, in UMW's opinion.

Utah P&L claims Burns Creek is unnecessary—there is more than ample power in the area—and that supporters of the project have strained to reach a favorable benefit-to-cost ratio for their project. The company claims the ratio, properly figured, would be a low 1.06-to-1.

Rep Gracie Pfost (D-Idaho) strongly favors the federal dam as a "necessary and logical follow-up to Palisades. It is as much a part of Palisades as a child to his parents."

Executive Reader

No more than two or three key executives flying together in the same plane is the normal rule of 60% of 102 companies surveyed. Such limitations on number and rank of executives are often "clearly understood" and effectively enforced, though not in written form in most cases. **National Industrial Conference Board.**

Two types of fuel cells for the production of electricity include the Bacon hydrogen-oxygen cell and a new type which would use a wide range of industrial fuel gases and distillate fuels. Work on the Bacon cell, of which a 5-kw unit was demonstrated in London, will be undertaken in the U. S. by Patterson-Moos Division, Universal Winding Co, and Pratt and Whitney Aircraft Division, United Aircraft Corp, under a licensing agreement with Britain's National Research and Development Corp. Development of the second type, which uses hydrocarbon vapor and air with a molten electrolyte in a magnesia sheet, was reported by Britain's Ministry of Power and Shell Research Ltd.

Spending will top $2 billion annually for the next four years in the natural gas industry, according to American Gas Assn. Spending this year will increase 15% to $1,859 million, with dollars earmarked for distribution facilities to go up 19.8% to $648 million, and up 13% to $809 million for transmission lines. **Forbes, August 1, 1959.**

How to cut industrial insurance costs is the subject of a new book written as a result of a special conference between editors of McGraw-Hill publications and specialists from three insurance companies serving the industrial field. Cost of the book, "How to Cut Your Insurance Costs", is $1.00. **Public Relations Dept, American Mutual Liability Insurance Co, Wakefield, Mass.**

Digital computer costs may be reduced through use of two new components in the development stage. Computer construction costs can be lowered drastically by an electronic switching circuit based on a superconductive, deposited-film device, announced Arthur D. Little, Inc, at the Cornell University Solid State Devices Research Conference. An operating circuit marks the end of the second stage in this cryotron research program. Faster cycle time, lower power use, smaller size, and simpler fabrication are potential advantages of a high-speed magnetic-film memory over the familiar ferrite toroidal core memory. The new type of memory has been operating as part of the TX-2 digital computer at the MIT Lincoln Laboratory since July.

L-M Kyle Type E 23 KV Recloser Now Interrupts 2500 Amps; Other Changes

More precise hydraulic mechanism; finger-tip choice of sequences; simplified contact construction permits conversion from 2.3 to 23 kv without changes.

By **LYLE McNULTY**
Application Engineer, Kyle Reclosers
Line Material Industries

L-M's Type E power class recloser has recently been improved to provide greater flexibility and convenience, a wider range of applications, higher interrupting capacity. Three Type E's may be electrically interlocked to provide 3-phase lockout when any one phase locks open.

Higher Interrupting Capacity

The Type E now provides interrupting ability 40 times coil rating, with a maximum of 2500 amperes, symmetrical, over the entire application range from 2.3 to 23 kv, without any addition or removal of parts.

Sequences Easily Changed

New, more precise and more versatile hydraulic mechanism. Improved timing control. Finger-tip choice of sequences. These can be changed in the field without special tools or any parts.

Simplified Construction

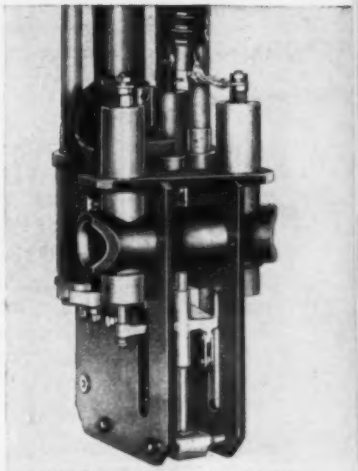
Contact buffer assembly simplified. No changes are necessary to convert from 2.3 to 23 kv in the field. Two identical contact tubes simplify maintenance, cut maintenance costs.

Improved Arc Extinction

Arcing chambers designed to give quick interruption with minimum of arc energy at high fault currents, and to provide supplementary oil turbulence required for lower fault currents.

Get Complete Information

The new Type E provides the same high-quality performance that has made Kyle Reclosers the undisputed leaders in the field. Ask the L-M Field Engineer for Bulletin CR1B on the New Type E, and information on other Kyle Reclosers, including Kyle-Klad equipment. Or write Line Material Industries, Milwaukee 1, Wisconsin. In Canada: Canadian Line Materials, Ltd., Toronto 13, Ontario.



THE NEW HIGHER-CAPACITY arc-interrupter mechanism handles up to 2500 amperes at 23 kv. Two vented arcing chambers. Double break contacts driven by toggle spring to insure rapid opening and closing. Moving contacts have separate load transfer and arcing surfaces to insure long wear.

LINE MATERIAL® Industries Kyle® Reclosers
McGRAW-EDISON COMPANY

389

DISTRIBUTION TRANSFORMERS • KYLE RECLOSERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTORS • POWER SWITCHING EQUIPMENT
PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING • LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE AND CONDUIT

NEW PRE-FAB SUBSTATION UNIT

New L-M Feeder-Pak® Provides Compact, Low-Cost, Low-Voltage-Side Unit

Shipped in pre-wired, assembled sections, ready for fast, economical installation in substation as complete 15 kv feeder unit.

by **W. V. SWAN**, Product Manager
Power Switching Equipment
Line Material Industries

The new L-M Feeder-Pak is a complete unit for the low-voltage side of a substation. It provides support for feeder conductors, disconnect and by-pass switches, lightning arresters, current transformers, and substation-type R or W three-phase Kyle heavy-duty recloser.

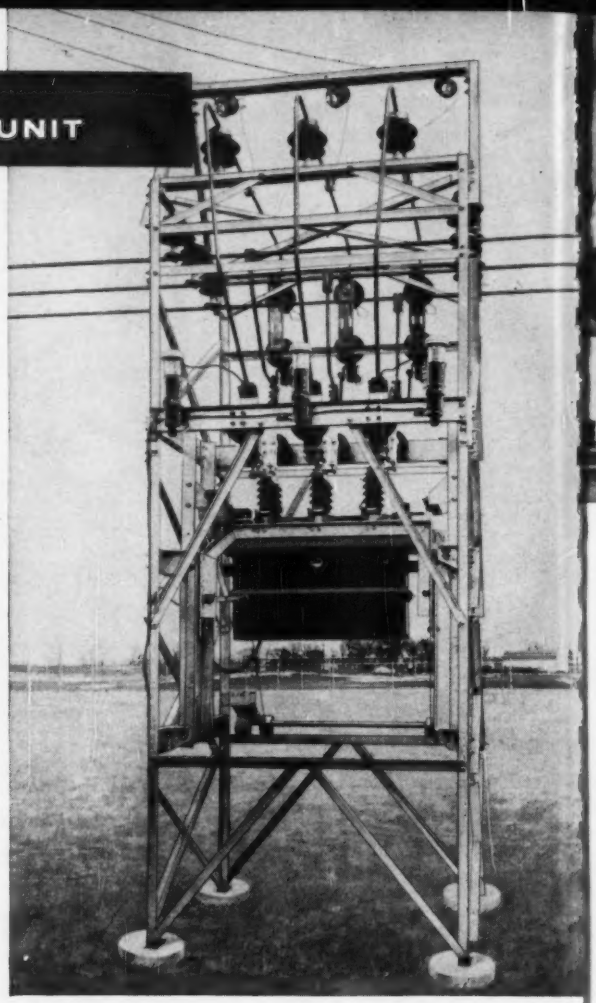
Neat, Compact

The unit has a very neat appearance. It is compact, easy to install. The whole unit comes in easy-to-handle crates. Additional units can easily be added when additional feeders are needed. Or units can be removed to other locations.

The Feeder-Pak costs about the same as the *materials* for a conventional open-type feeder position, but installation costs are far lower. Bus, insulators, switches, and arresters are all in place. No concrete pad is needed—only footings for the four legs. And it takes less land area—it's only 5 feet, 4 inches square!

Easy to Install

To erect the L-M Feeder-Pak, simply bolt the lower section to the concrete footings; set the upper section into the lower section and bolt; raise the recloser into position with the hoisting mechanism included in the lower section. Self-aligning bayonet-type contacts work automatically as recloser is raised into position. Automatic interlock prevents lowering the recloser until recloser contacts are opened.



THE NEW L-M FEEDER-PAK. The lower pre-assembled steel section contains the recloser, and recloser lifting frame and lifting mechanism. The unit is neat, compact. Base is only 5 feet, 4 inches square. It saves land, cuts installation and maintenance time. No mounting pad is required—just footings for the four legs.

L-M Feeder-Pak Features

1. With Kyle Type R or W recloser provides complete structure and equipment for low-voltage side of the substation.

2. Complete; compact; neat. Saves land costs; requires no pad; cuts installation man-hours.

3. Shipped as partly assembled units, crated for easy handling. Switches, arresters, and recloser disconnects are all pre-wired, and installed. Current transformers if desired.

4. Additional feeder positions are easy to add; or the Feeder-Pak may be removed to another location if desired.

5. Recloser lifting frame and tank lifting device make recloser maintenance safe and simple.

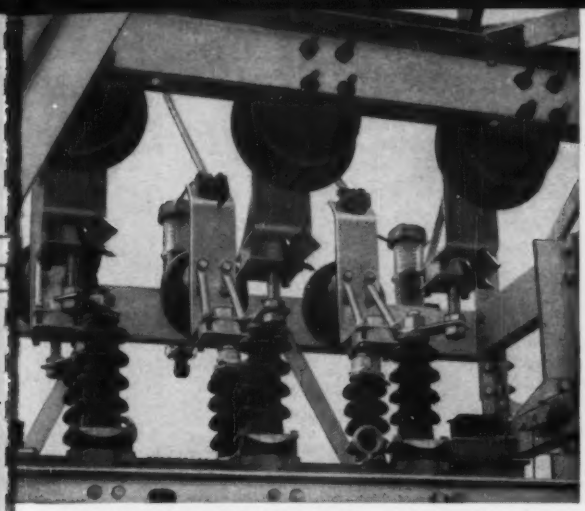
LINE MATERIAL® Industries
McGRAW-EDISON COMPANY

McGRAW EDISON

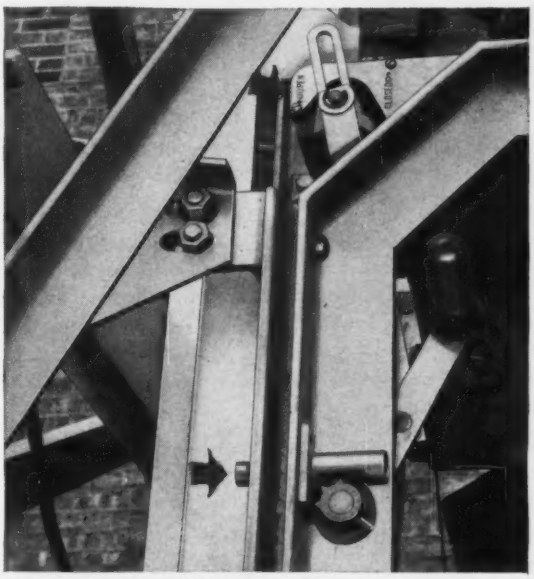
Substations and Power Switching Equipment®

399R

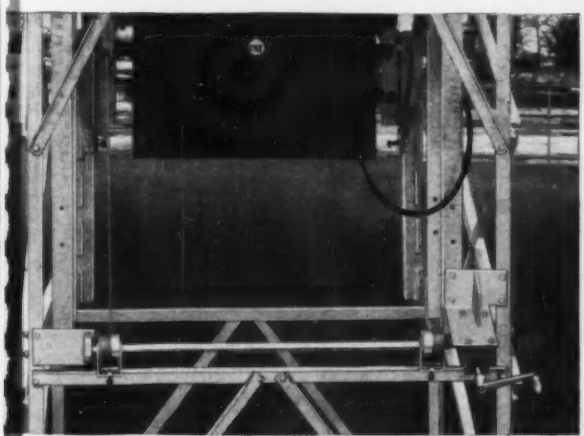
DISTRIBUTION TRANSFORMERS • KYLE RECLOSERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS • POWER SWITCHING EQUIPMENT
PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING • LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE AND CONDUIT



BAYONET CONTACTS on the recloser bushings are raised into the self-aligning automatic disconnects when the recloser is lifted into position. Thus connections are made safely, simply, and automatically.



CONTROL LEVER INTERLOCK. Recloser cannot be lowered until recloser contacts have been opened by moving the handle down (arrow).



RECLOSER LIFTING MECHANISM makes it easy to lower the recloser, and, if desired, to lower the tank to inspect the mechanism, change coils or time-current characteristics —which is easily and accurately done on Kyle reclosers— or for periodic oil change.

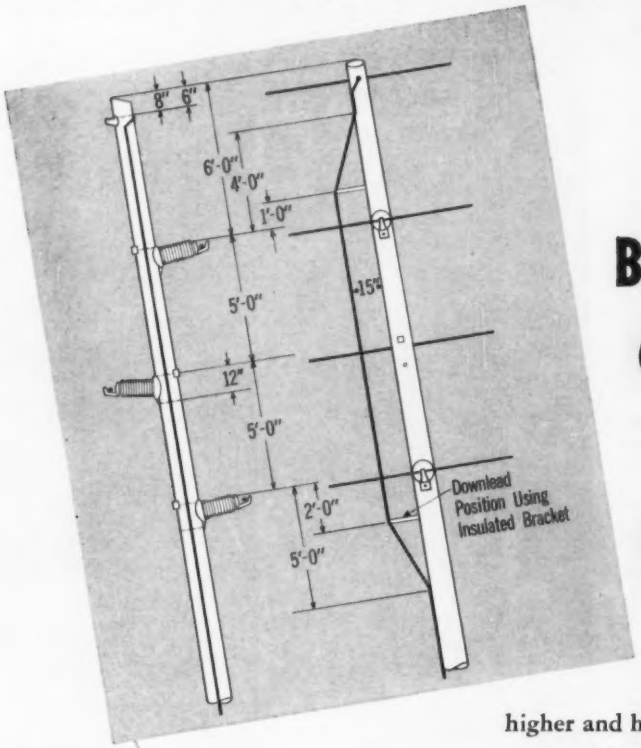
LINEMAN CLOSES BYPASS SWITCHES before lowering the recloser. These are L-M Type HXO heavy-duty fused switches. They are mounted on the frame and connected to the bus at the factory.

WHEN LOWER FRAME IS MOUNTED ON FOOTINGS, upper sections are simply mounted into position and bolted to the lower section at the corners. This is all it takes to assemble the entire unit!

Get This Data on New L-M Feeder-Pak

Let us provide complete information on standard equipment and optional accessories. Then check your own present and proposed substation locations to see how this new L-M Feeder-Pak will save you money and man-hours, installation and maintenance. Talk to the L-M Field Engineer. Or write Line Material Industries, Milwaukee 1, Wisconsin. In Canada: Canadian Line Materials, Ltd., Toronto 13, Ontario.

IMPORTANT COST REDUCTION IN TRANSMISSION LINE CONSTRUCTION



Build this 69 kv transmission line with only 7 bolts per structure

Here is a line design that reduces the labor component of construction cost. Good news for builders that find labor factors higher and higher!

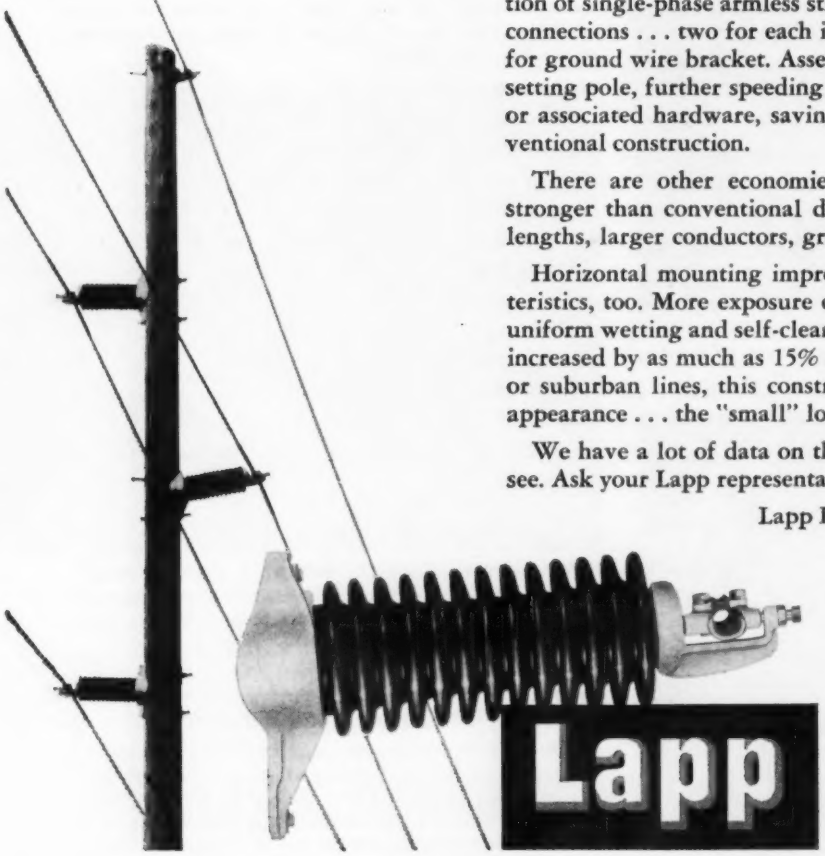
Use of horizontally-mounted Lapp Line Posts permits erection of single-phase armless structures, with only seven bolted connections . . . two for each integral-gain-base insulator, one for ground wire bracket. Assembly is done before raising and setting pole, further speeding erection. Without arms, braces, or associated hardware, savings are an actual 25% over conventional construction.

There are other economies also. Armless structures are stronger than conventional designs, permitting greater span lengths, larger conductors, greater factors of safety.

Horizontal mounting improves insulator electrical characteristics, too. More exposure of insulator surfaces encourages uniform wetting and self-cleaning . . . wet flashover values are increased by as much as 15% over upright ratings. For urban or suburban lines, this construction offers trim, unobtrusive appearance . . . the "small" look of a distribution line.

We have a lot of data on this construction that you should see. Ask your Lapp representative or write:

Lapp Insulator Co., Inc., Le Roy, N. Y.



Lapp

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25 and 50 kvar, 2400 thru 7960-volt capacitors

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- meet all the national standards
- a *complete* capacitor package (capacitors, racks, voltage and current controls, other accessories)
- Five years of research, design and development bring you the best in capacitor engineering!

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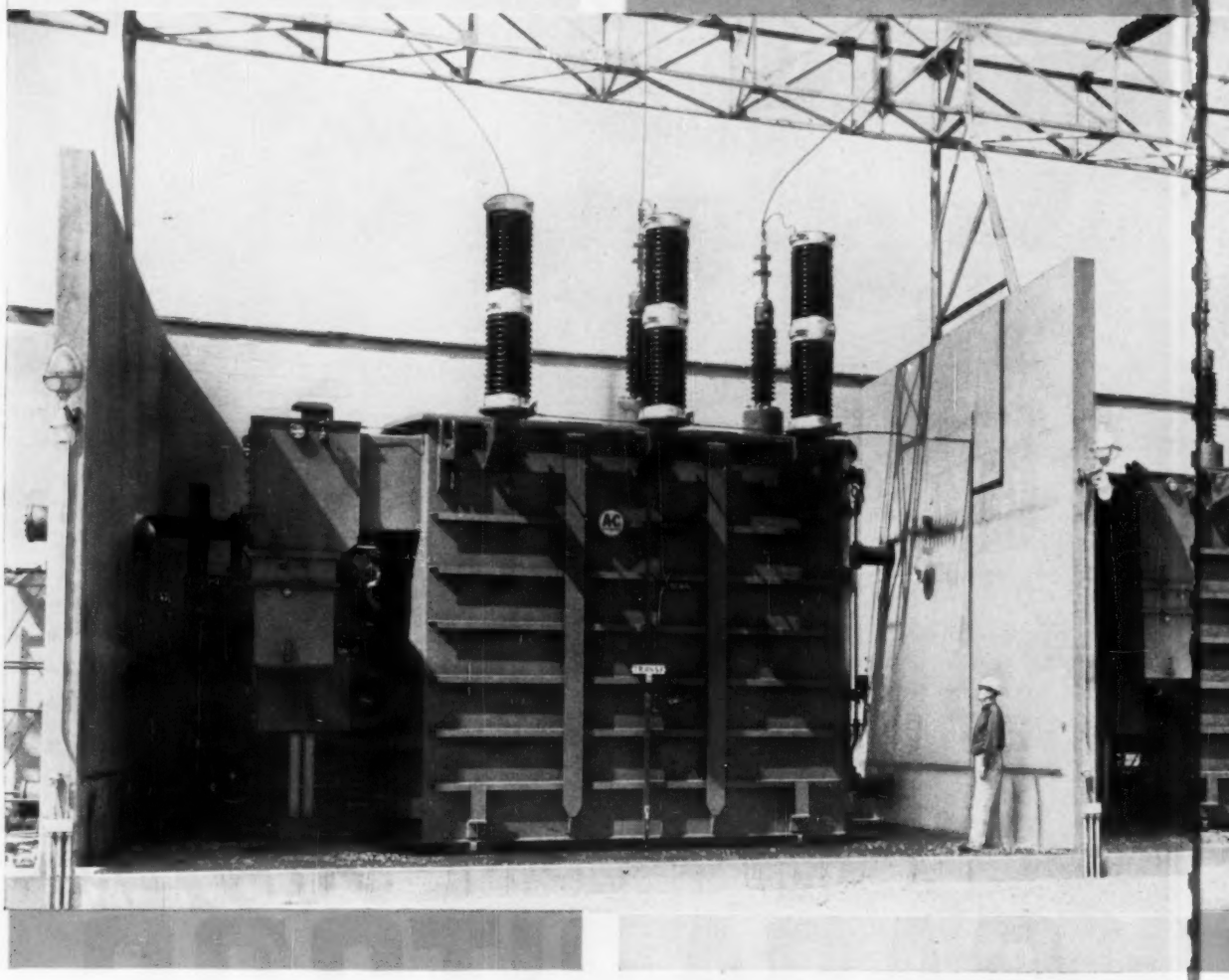
A-1160-E

ALLIS-CHALMERS modern

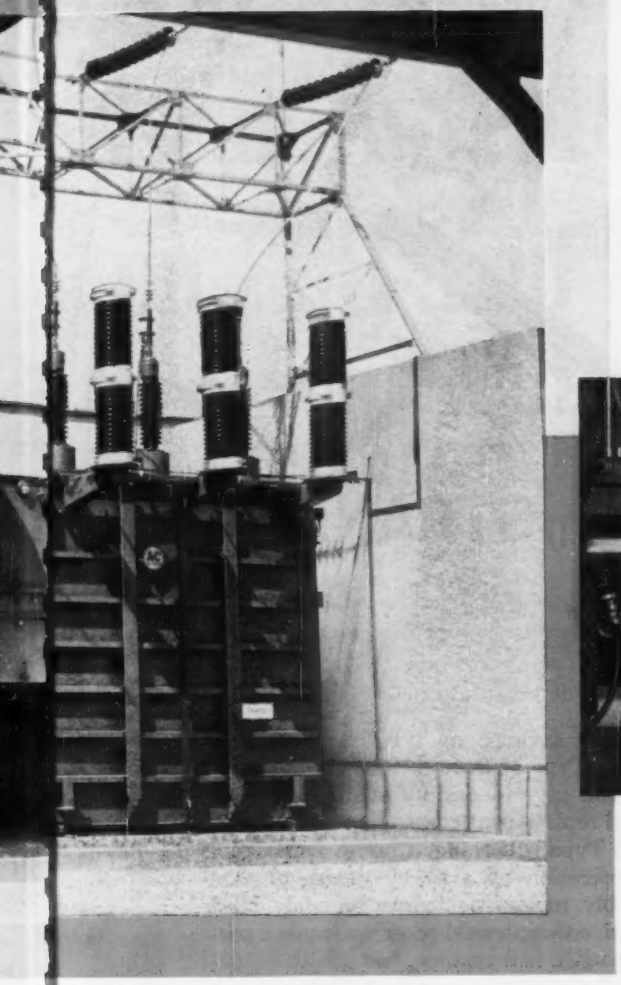


AT WISCONSIN ELECTRIC POWER COMPANY

Dual cooling takes the heat off emergency loads

*Patented

line for '59



Plan to stay ahead... MODERNIZE!

Manual shutoff valves serving transformer cooling equipment piping are opened when dual cooling is necessary. A transformer can be taken from service without draining the oil from the unit or its piping.

A-1155-E

Either of two 90-mva transformers is capable of carrying 2/3 of the combined capacity by using the "dual-cooled" feature

Wisconsin Electric Power Company counts on *designed-in* power transformer emergency capacity. Exclusive *dual-cooled* arrangement* uprates either one of the 90-mva transformers to 120 mva if the other is removed from the line.

The active transformer utilizes all of the other unit's oil-to-air cooling equipment to dissipate heat. In normal operation, each transformer uses its own coolers independently.

Stepping down 138,000 volts to 13,800 volts, the transformer bank employs accordion-type expansion joints between transformers. Header pipes allow for manual cutoff. The installation has been designed to permit adding a third transformer should demand require it.

Dual cooling is but one of many A-C advantages resulting from continuing transformer research. Others include corona-free design, quiet operation, reduced size and weight, high short-circuit strength. A call to your A-C man will bring further dual-cooling power transformer details.

ALLIS-CHALMERS A-C *POWER FOR THE FUTURE*

double-barreled savings!

with Copperweld TYPE M STRAND

T.M.

If you're aiming for savings, you'll hit your mark by using Copperweld Type M Strand. Since Copperweld is non-rusting, you save money by eliminating both maintenance and replacement costs.

Every wire in Type M Strand is permanently protected against corrosion by a heavy sheath of pure copper inseparably molten-welded to an alloy steel core. This exclusive Copperweld process assures a permanent high-strength, non-rusting strand with a ductile copper covering that will never crack, flake or peel.

Easy to handle—easy to install—Type M Strand can be readily bent, served, moused or clamped. Write us today for complete information about its money-saving features.

COPPERWELD STEEL COMPANY

WIRE AND CABLE DIVISION *Glassport, Pa.*

For Export: COPPERWELD STEEL INTERNATIONAL COMPANY, New York

Copperweld®

TYPE **M** STRAND

FOR GUYS AND MESSENGERS

struction at this point. Each terminal is equipped with a clamp-type connector to take leads up to No. 6 AWG. ●

to take No. 2 AWG to 300 MCM cable. This makes a tight, low-resistance connection to the line conductor. ●

remote indication accurate to 1.0 per cent can be obtained with a totalizing d-c current transformer system.

New Electric Utility Study Could Herald Advent of Standardization on 200-amp Capacity Meters

TEST RESULTS FROM 21 ELECTRIC UTILITIES PROVE CLASS 200 METERS EQUAL PERFORMANCE OF CLASS 60 AND 100's AT ALL LOADS

SOMERSWORTH, N. H.—One of the most important questions currently facing electric utilities was answered today when the General Electric Company released results of a nation-wide, in-series test comparison of Class 200 versus Classes 60 and 100 watthour meters.

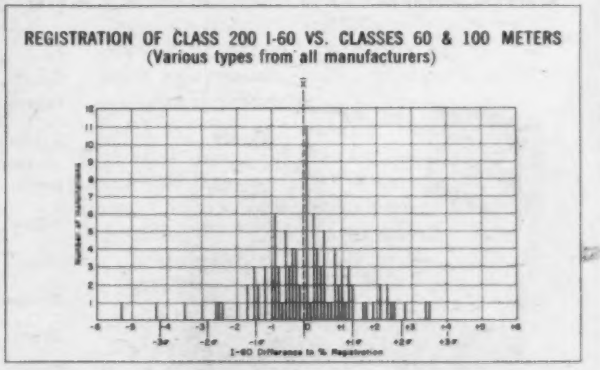
Conducted by 21 utilities at the invitation of General Electric's Meter Department, the tests showed conclusively that Class 200 meters—such as G.E.'s I-60—can equal or better the performance of any existing single-phase meter at all loads up to 200 amperes.

At each of 114 residential test sites, a Class 200 meter was mounted on the line side of, and in series with, either a Class 60 or a Class 100 meter. Meters of four manufacturers were used in the tests which extended over periods ranging from seven days to ten months.

On the strength of this series comparison test study, more electric utilities could decide to standardize on Class 200 metering to simplify purchasing routines and reduce meter inventories.

Data contained in this series comparison test report can also be utilized to compare the performance of competitive Classes 60, 100 and 200 meters. Complete copies of the study can be obtained from G.E. by filling out and returning the coupon on the next page.

In comparison tests, the Class 200 meter was placed on the line side in series with the billing meter. Meters were 3-wire, 240-volt.



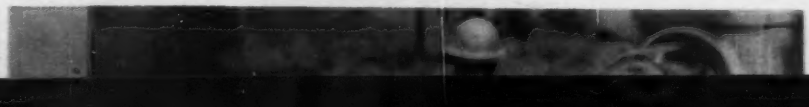
Typical series test chart from G.E.'s report compares performance of G.E.'s Class 200 meter versus 114 Classes 60 and 100 billing meters.

PLEASE TURN PAGE

GENERAL ELECTRIC

ACCURACY (Testing)

The primary winding is of the continu-



the core and other grounded structure consists of compound cylinders, kraft pressboard collars, and barriers.

tional a-c current transformer is of a window-type design which slips over the d-c bus or cable.

parts during transportation and installation. The entire core and coil structure is suspended from the tank cover.

Electric Utility Comparison Tests Prove General Electric I-60 Watthour Meters Outperform Competitive Class 200 Meters

SOMERSWORTH, N. H.—One fact stood out clearly today as results of a nation-wide, in-series test comparison of Class 200 versus Classes 60 and 100 watthour meters were announced. It was that General Electric's Class 200 I-60 single-phase meter's performance is "significantly better" than that of competitive Class 200 meters.

The tests—conducted by more than a score of electric utility companies—consisted of individual residential applications of a Class 200 meter mounted in series with a Class 60 or Class 100 billing meter. Comparison test results from each utility were forwarded to General Electric where they were compiled, categorized and factored into an overall report. The combined results are sufficiently large to permit fair comparisons and unbiased conclusions.

Meters of four manufacturers were used in the series comparisons, and test periods extended from seven days to ten months. In summary, here's how the four Class 200 meters performed:

PERCENT DIFFERENCE IN CLASS 200 METER REGISTRATION	
G.E.	−.28%
MFR. A	−.72%
MFR. B	−1.18%
MFR. C	−.55%

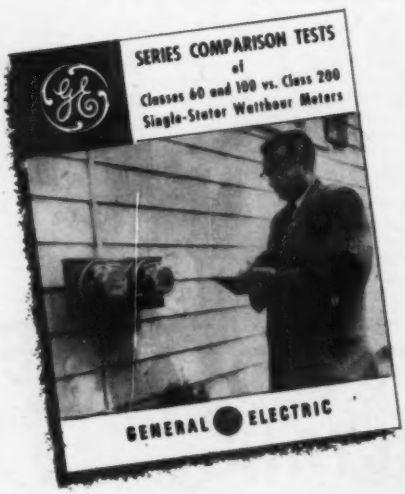
Electric utility comparison test results show General Electric's I-60 is today's best-performing Class 200 meter.

The superior performance of General Electric's I-60 meter is attributable in large part to its unequalled "on-line" accuracy at all loads—from the smallest lighting loads to heavy house-heating and air-conditioning loads. In addition, the I-60 features G.E.'s unique magnetic suspension—a truly lifetime bearing system. More than 10,000,000 General Electric meters with magnetic suspensions are in service today, without a single failure of the "floating disk" being reported.

Copies of the complete series comparison test report are available now from General Electric. To obtain your copy, fill out and return the coupon below.

Cut along dotted line

FOR FREE COPY OF COMPLETE, TWO-YEAR ELECTRIC UTILITY COMPARISON TEST-STUDY FILL OUT AND RETURN THIS COUPON



General Electric Company
Section 628-30
Schenectady 5, New York

Please send me a copy of bulletin GET-3025, "Series Comparison Tests of Classes 60 and 100 versus Class 200 Single Stator Watthour Meters."

Name_____

Title_____

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Progress Is Our Most Important Product

GENERAL ELECTRIC

LIFE BACKGROUND

Thinking on the subject of mechanical

YOU GET

LONG-LASTING PROTECTION FOR YOUR OVERHEAD SYSTEM

with

BLACKBURN *Grounding* DEVICES

Type GTC 1
One plate tower ground clamp

Type GTC 2
Two plate tower ground clamp

Copper Bonded Pigtail

Type GUV
U-bolt ground clamp parallel or 90°

Steel Driving Stud for Sectional Ground Rods

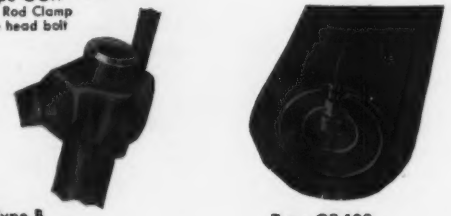
Type GG
Ground Rod Clamp
Socket set screw

Copper Alloy Coupling for Sectional Ground Rods

Copper Bonded Sectional Ground Rods

Copper Bonded Regular Ground Rods

Type GGH
Ground Rod Clamp
Square head bolt



Type B
Budget Line Ground Rod Clamp
Square head bolt

Type GP 100
Electrolytic Copper Pole Bottom Plates
7½", 10", 14" dia.

Blackburn grounding devices will save you thousands of dollars annually in preventing burnouts of expensive overhead equipment. This complete line simplifies your stocking problem—one source for all your needs. Like all BLACKBURN products they are constructed of high-strength corrosion resistant materials—designed for easy installation and engineered for long-lasting, trouble-free grounding. Always specify BLACKBURN.

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Tiger Brand Type RR Cable being prepared for underground installation on Indiana Toll Road. ▶

USS

Tiger Brand Electrical Wire & Cable

A standard cable for every special job

- Asbestos Wire and Cable
- Mold-Cured Portable Cord
- Shovel & Dredge Cable
- Paper & Lead Cable
- Varnished Cambric Cable
- Interlocked Armor Cable
- Special Purpose Wire & Cable
- Aerial, Underground and Submarine Cable

What's the difference in electrical cable?

In USS Tiger Brand Type RR Cable, it's Engineering Know-How

Ever since 1891, American Steel & Wire has been producing Electrical Wire and Cable. Thus you get the advantage of all the research, engineering skill and manufacturing experience gained in over 68 years of making every type of cable from the smallest control cables to the largest submarine dredge cables.

Tiger Brand Type RR Power Cable is made on the newest type equipment in the industry with the latest electronic controls. You are assured a superior, long-lasting cable—one that makes use of insulating and jacketing compounds that are the latest development from *our* research and development laboratory.

Better insulation. Here is the latest development. For high-voltage applications, Amerzone B is tops. It is a butyl rubber insulation that can be operated at copper temperatures of 90°C. It also has outstanding resistance to moisture and the effects of ozone. Amerzone B is designed for cables in the 5,000 to 15,000 volt class. For low-voltage use, where comparable heat and moisture resistance is required, Tiger Brand Butyl RHW insulation is used.

Better jackets. Amerprene 90 is a specially compounded neoprene jacket to match the heat resistance of Amerzone B insulation. It is highly resistant to soil acids, abrasion, water, oil and age.

Variety of applications. Tiger Brand Type RR Cable is widely used for direct burial in the soil, in conduit or ducts, or for aerial cable.

Applications include:

- Highway service area lighting
- Street lighting
- Airport lighting
- Lighting and power circuits in industrial plants, railway yards, parks, athletic fields, golf courses
- Secondary distribution networks
- Branch connections between buildings
- Underground service entrance
- Rural extensions
- Power feeds for underground mines

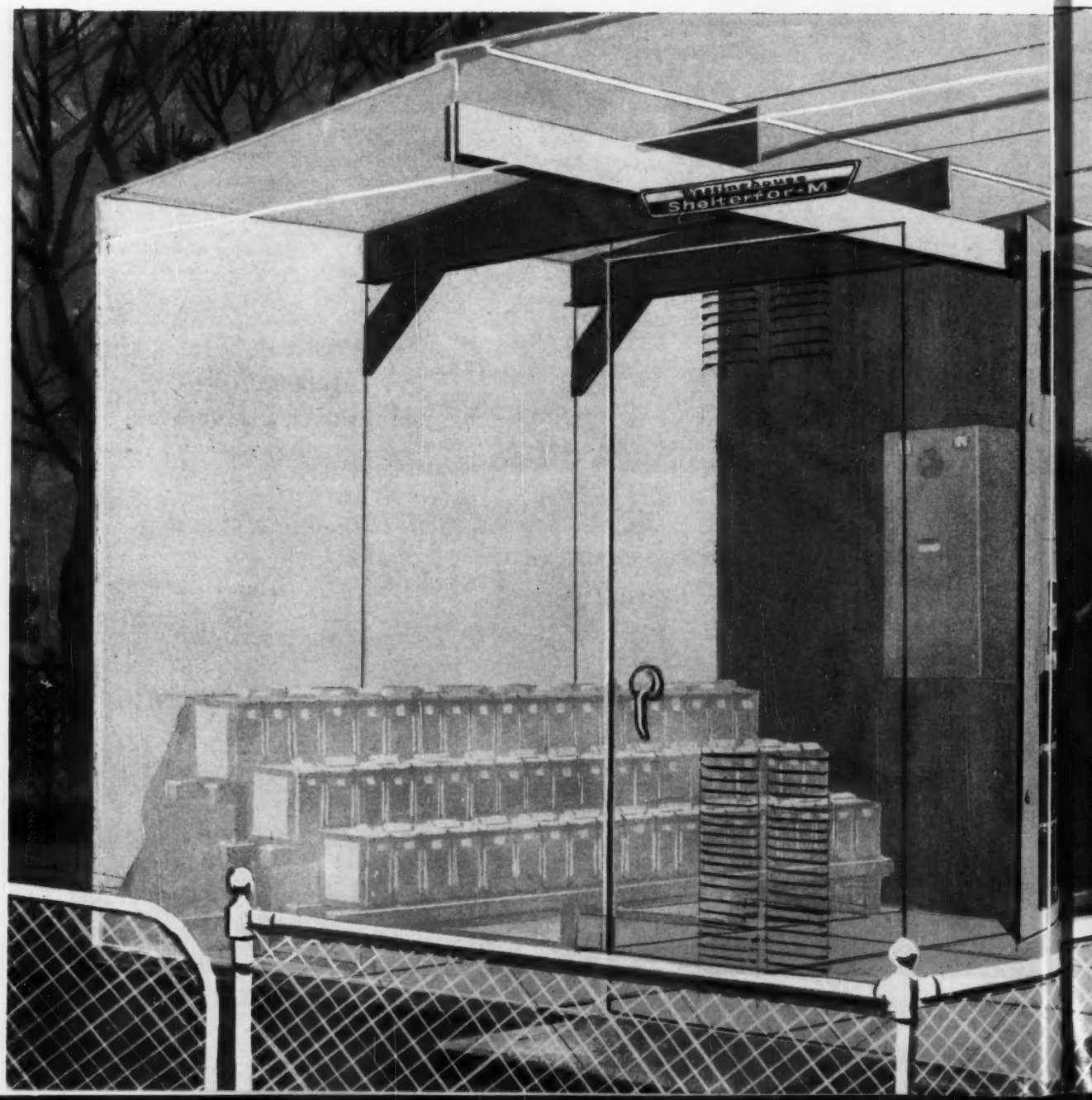
For further information about Type RR Cable, write for brochure containing complete specifications on Amerzone B, Butyl RHW, and Amerprene 90 compounds. American Steel & Wire, Dept. 9271, 614 Superior Avenue, N.W., Cleveland 13, Ohio.

USS, Tiger Brand, Amerzone and Amerprene are trademarks

American Steel & Wire Division of United States Steel

Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors
Tennessee Coal & Iron Division, Fairfield, Ala., Southern Distributors
United States Steel Export Company, Distributors Abroad

Westinghouse primary unit substations available with Shelterfor-M* all-weather service area



Your crews will *pick* poor-weather days for inspection and testing of Westinghouse outdoor metal-clad switchgear. Protected aisles and the new integral service area of Shelterfor-M† switchgear permit crews to work *inside* on *outdoor* switchgear in cold, rain, snow or sleet. No need to hang canvas tarps and build makeshift shelters to work on breakers, instruments or relays when the weather is bad.

Roomy aisles of Shelterfor-M give you ample room to pass two breakers . . . plenty of room to pull out units for inspection.

Where required, the new Westinghouse modular service area units can be added to provide additional area for batteries, maintenance, storage and other facilities. This eliminates conventional concrete block buildings that often are erected in a corner of the station plot.

For complete information, call your Westinghouse sales engineer, or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa. J-60973

*Shelterfor-M . . . shelter for maintenance
†Trade-Mark

YOU CAN BE SURE...IF IT'S Westinghouse

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV FRIDAYS

Here are answers to some about **KPF** switches

Q. *How can KPF switch blades maintain positive contact with switch clip under changing line sag conditions?*

A. Two heavy copper clips, bolted to a shoe carrying the flexible jumper, are mounted inside a special "horseshoe shaped" casting by two toggle bolts. These toggle bolts pass freely through the outer leaves of the clips, and the entire contact assembly "floats" on these bolts. Half-spherical bolt heads and adjusting nuts permit movement in any direction. The tension of the clip leaves on the blade is sufficient to insure positive alignment, since either clip or blade can follow the other to conform to line sag changes.

Q. *How can insulator stacks follow normal line sag changes?*

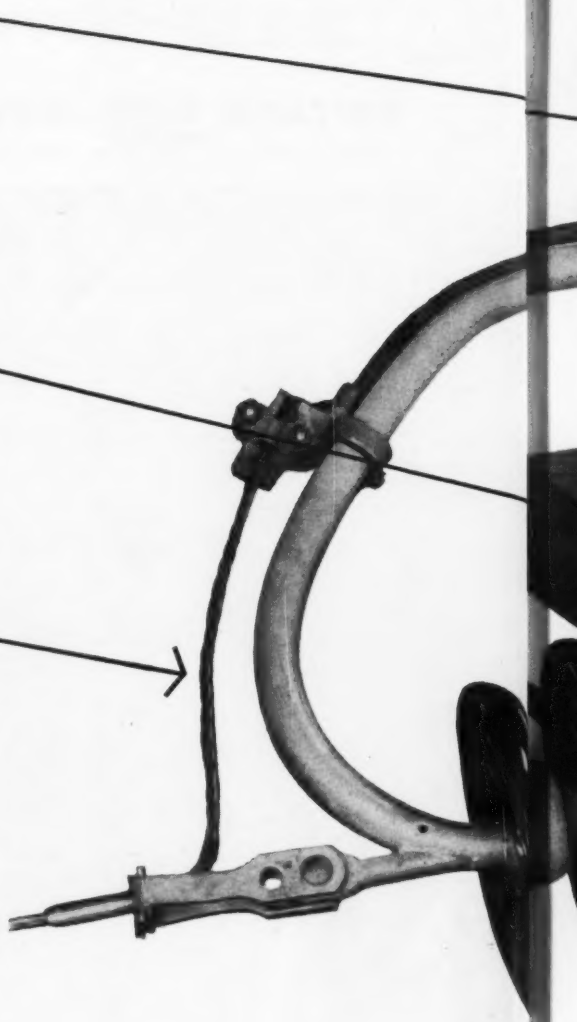
A. The insulator stack bearing units may be likened to limited universal joints. The actual bearing, a monel pin in an everdur trunnion, allows 90° movement of the rotating arm of the phase unit, as well as approximately 7° vertical movement to follow line sag. It is impossible for the bearing to bind under normal line stress, and insulator stacks always follow the sag of the conductor.

Q. *How are conductors connected to KPF switches?*

A. With KPF Type A switches, the user eliminates dead-end insulators. Any standard strain clamp can be used, and hot lines may be dead-ended directly to the phase units. Switch arms and dead-end eyes are integral with the insulator assembly. The conductor is lead through the strain clamp and on to a copper terminal on the switch arm. Aluminum conductors may be connected to the switch arm through special KPF terminals designed for this service. Type A switches may be mounted on a separate crossarm with conductors deadened below or above (for angle-pole installations, etc.). Switch operates equally well with or without line tension.

Q. *For what voltages are KPF air break switches available?*

A. KPF Type A and S standard "line-tension" switches are available for common voltages from 7.5 to 110 KV. Special switches combining a disconnect with a fuseholder (Type UF, double-cross-arm mounting) and for use where line tension is not present are also offered in these same voltage ranges. Ground switches are available for Type A or S switches. Type R switches are offered for use where line tension is not present or it is desired to use a specific type of apparatus insulator.



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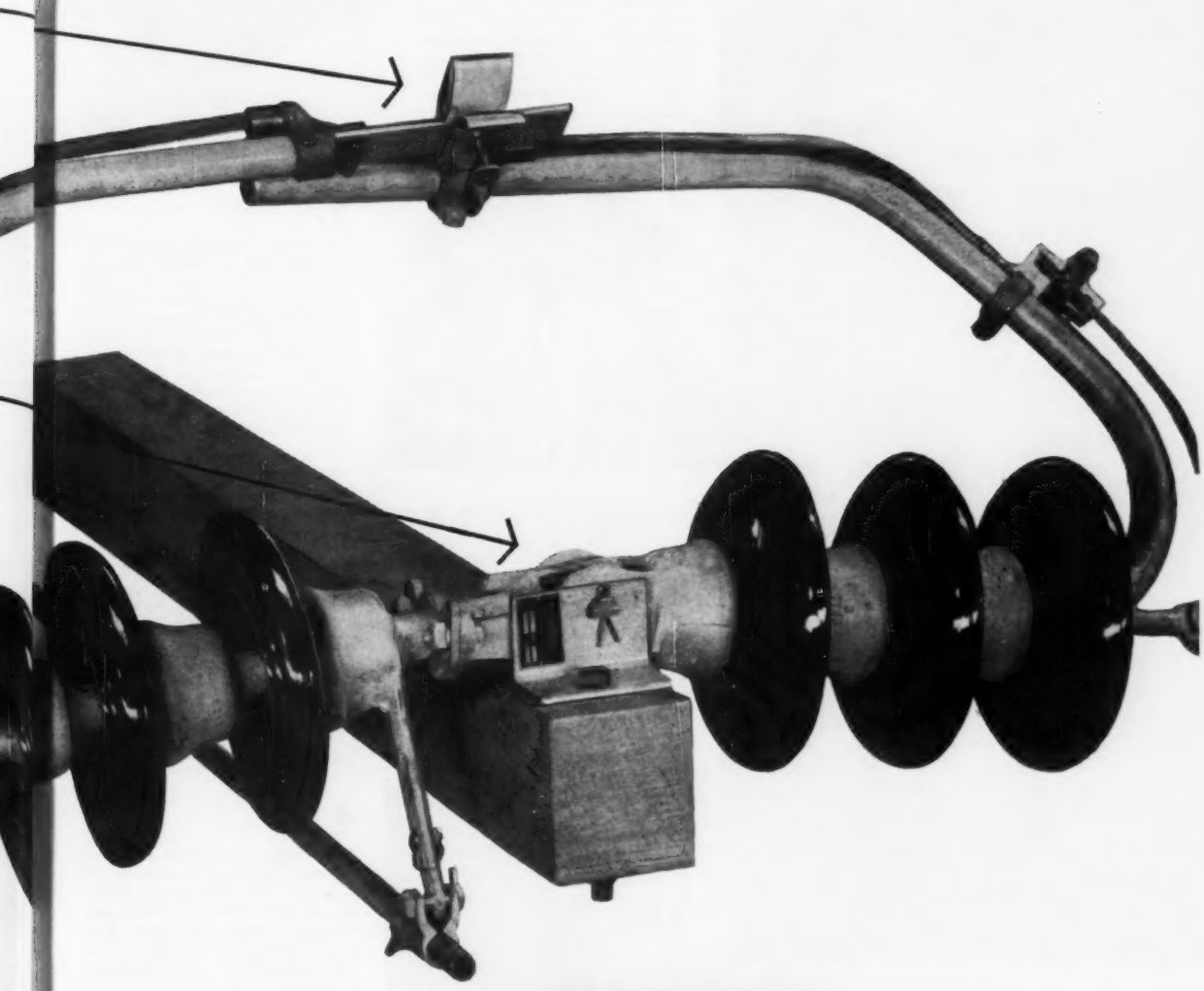

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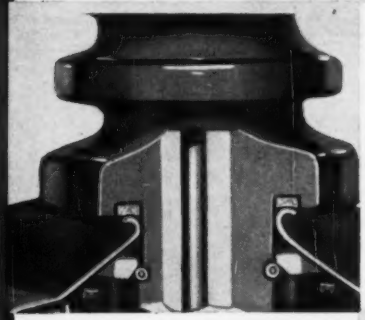
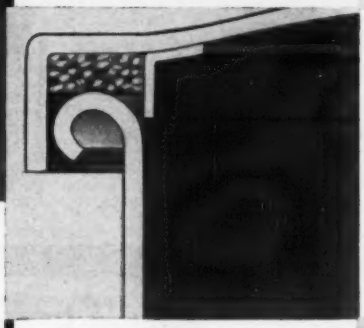
All bushings are made of high strength, wet-process, porcelain and are internally clamped using one piece Almag clamps. The high voltage bushings have a configuration design to obtain liberal creepage without excessive height and to assure high impact strength. Each gasket is made of reusable cork-neoprene and is retained.

Sidewall bushings have the hardware keyed to the porcelain and the porcelain keyed to the tankwall, thereby preventing rotation of the bushing or any of its parts. Sidewall mounted high voltage bushings are equipped with a special cap for clamping the conductor in place quickly and safely without the use of tools.



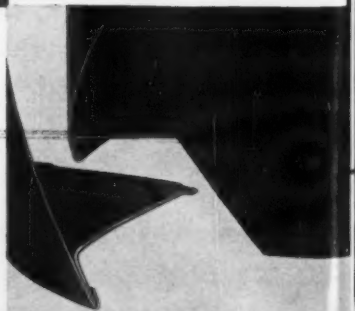
Cover mounted bushings are mounted on a smooth flange raised above the cover. This smooth rounded flange and the shape of the porcelain positively prevents the entrance of moisture. The contour of the flange eliminates corona at this point. Protective caps are provided for all cover mounted high voltage bushings.

Connectors are electro-tin coated and large enough to accommodate either the copper conductors specified by EEI-NEMA Standards or the ACSR equivalent. The large contact surface and a double-coil spring-type washer reduces conductor cold flow.



The tank and cover are die-formed assuring consistently accurate fit. The cover overhangs the tankwall and is dome shaped to shed moisture. The combination of a rolled top rim, cover overhang, cork-neoprene gasket and the gasket retainer positively seals the tank from moisture.

The base is welded to the tank wall. Then a sealing mastic is applied and the tank wall is rolled under the base flange to provide a triple thickness of metal. The tank and cover are painted by a hot-spray process and each coat is baked to form an extremely durable finish.



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Editorial Comment

SEPTEMBER 7, 1959

Underground Is No Panacea

Two fundamental differences between underground and overhead construction must be understood by laymen agitating for underground transmission or distribution: First, underground costs more, and the differential must be paid by someone. Second, while comparatively free from weather-induced troubles, underground can have its own breed of difficulties. When they arise, they're tougher to find and repair, which means longer, more costly outages.

The recent Consolidated Edison outage (EW, Aug. 24, p 42 and Aug. 31, p 54) furnishes a potent reminder that underground systems are not immune to trouble—and are generally more difficult than equivalent overheads to repair and restore to service following trouble.

This is not to imply that underground is not, over the long haul, much more reliable. And the Con Edison networks, serving very high load and population densities, certainly have to be underground.

Yet it is essential, when reviewing with customers, governments, and citizens' groups demands to put utility lines under the streets, that they be fully informed that underground construction is not a complete panacea.

The omission of this point can create serious misunderstanding which may result in recriminations if heavy trouble does then occur.

Outage Gives Con Edison Tough Story to Tell

Any interruption of electric service as extensive as that in New York City last month is bound to bring recriminations from political sources and criticism from the unenlightened press. This instance was no exception.

Despite a magnificently-coordinated service restoration effort by Con Edison's operating department, and an outstanding public information service to newspapers, radio, and TV during the emergency, sharp criticism of the utility surrounded an exchange of preliminary technical reports with the City's Dept of Water Supply, Gas and Electricity.

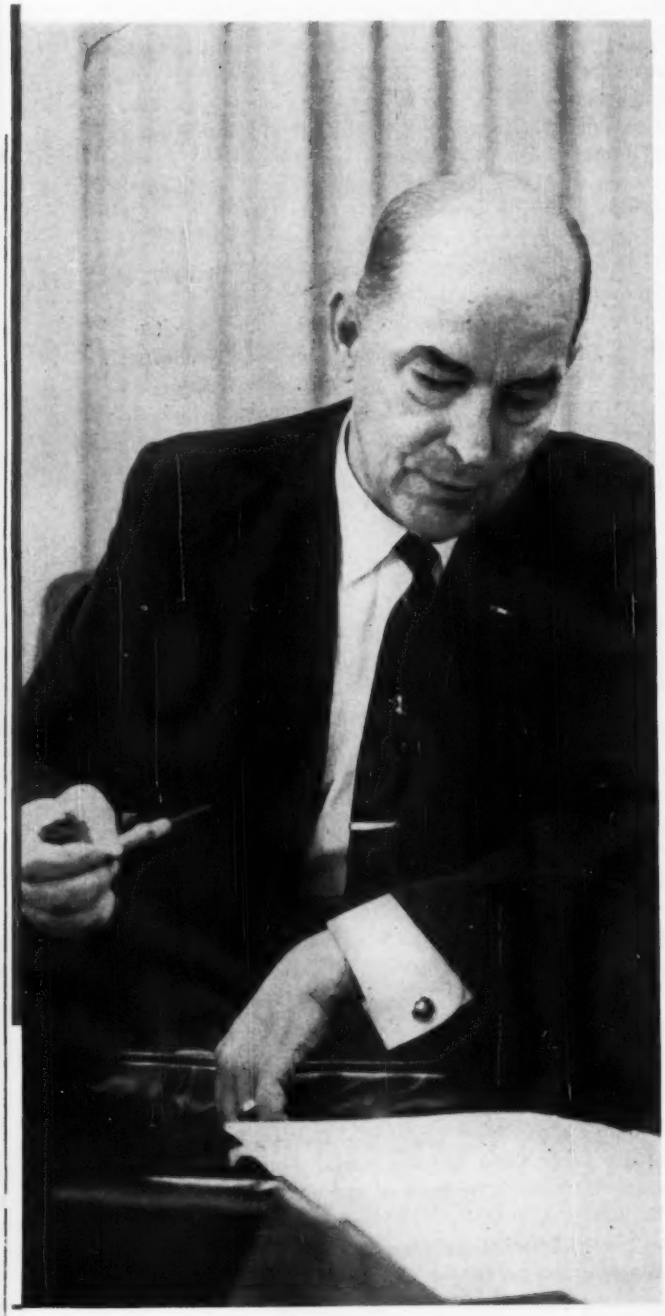
In interpreting these reports, the press drew its own conclusions. It read implications of uncertainty and blame into statements regarding the origin and nature of the multiple cable failures and their contribution to the outage.

At best, Con Edison spokesmen even today face a difficult task in clarifying and interpreting the circumstances. For the New York system apparently had been seized by localized epidemic of the type of cable failures that commonly occur in the course of normal operation, even in the best maintained underground systems. The difficulty lies in making it seem plausible to the lay press and the public that the *improbable* chance of seven random feeder failures in one network area was *possible*, particularly in New York, where up to 20 scattered cable faults a day have occurred.

It is not surprising that the public press and the public should fail to grasp a situation like this, founded as it is in the laws of chance. The experience teaches one lesson: no utility can completely and continuously avoid the multiple hazards to which power systems are exposed. When the odds turn sour, full, frank and complete explanation of the circumstances, however improbable, is the only prudent course.

TVA's Vogel Airs His Views on Bonds,

In an exclusive interview with Electrical World, TVA Board Chairman General Herbert D. Vogel outlines his ideas on the implications of its newly acquired bond-issuing power, buying policies and growth prospects



Question: General, during your five years as TVA board chairman, the Authority's installed capacity has risen from 6,349,185 to 11,422,210 kw, an increase of 80%. Do you expect this growth rate of more than 15% a year to continue for the next five years?

General Vogel: I can't answer that categorically. Let me say this: A sizable amount of the growth in TVA generating capacity over the past five years has been due to a large increase in the loads of the federal agencies, chiefly AEC. No very large increase in the federal defense loads is anticipated in the next five years. Consequently the rate of load in TVA generating capacity is expected to be somewhat less in the next five years than it was in the past five years. Excluding federal defense loads, however, the rate of growth in demands on the TVA system is expected to average about 10.5% a year—about the same as during the past five years. This will amount to an increase in demand ranging from 800,000 to 1-million kw a year.

Q. In a previous Electrical World interview (EW, Mar. 4, 1957, p 51), you said you wanted TVA to adopt "more business-like procedures." Has anything been done along these lines?

Vogel: Yes, I think so. We have materially strengthened the board's role. It is now a working, day-by-day kind of operation concerned with very real, down-to-earth problems. We have also strengthened the general manager's office to provide for a continuing study of management policies and methods.

Q. Now that the TVA Bond Bill is law, would you comment on the role you and the other directors played in reaching a compromise acceptable to the President.

Vogel: Well, I will say the President has time and again indicated his desire for legislation of this kind. He felt, however, that there were certain clauses in it that might tend to erode the power of the Presidency and thus set bad precedents. Congress eliminated those provisions. As to details of our discussion, you can understand our reluctance to comment further.

Q. The Bond Bill authorizes you to issue up to $750 million in bonds. When do you expect to make your first issue, and how large will it be?

Vogel: I should say the first issue will probably come along in mid- or late spring, 1960. As to the amount, it is difficult to hazard a guess at this time. So much depends on the progress of construction, on earnings, and on other variables. We are proceeding cautiously, to be certain that we do not obligate ourselves beyond our needs. I should say that the recently published Business Week estimate of $50-75 million is within the range we are considering.

Q. Do you see any changes in TVA policy, other than in financing, occasioned by passage of the bill?

Vogel: No. Basic policies of TVA are set forth in the TVA Act and were reaffirmed by the Financing Bill, including, to quote from the amendment, "The objective that power shall be sold at rates as low as are

Foreign Purchasing

feasible." We shall continue to encourage development of the valley's resources, for that task is far from completed, and to furnish all the power that is needed.

Q. You have advised the President that your board still considers TVA subject to the Government Corporations Control Act, which requires Presidential review of your uses of bond and power revenues. Some say this is now unnecessary. What is your view, and what will be your operating philosophy?

Vogel: I assume you are referring to Sections 102 and 103 of the Government Corporation Control Act which govern submission of the budgets of the government corporations. TVA will still submit its estimates to the Budget Bureau as it has in the past, and its estimates, as modified, amended, or revised by the President, are transmitted to Congress as part of the annual budget. However, procedures established by the Government Corporation Control Act are not entirely the same for corporate funds as they are for appropriations. No further action by Congress is necessary to permit the issuance of bonds or expenditures of the proceeds.

Now, if I correctly understand your question, you are inquiring not only as to the legal responsibilities of TVA, but also as to the operating philosophy of the TVA board. Congress has given the TVA board a public utility responsibility for an area which is defined in the law with considerable precision. We have a duty to provide all the electric energy needed to serve that area within the limitations fixed by the law, and we regard that duty seriously. We are satisfied that this is what the President and Congress expect of us.

Q. General, a great deal of criticism has been levelled at TVA's purchasing practices—from the buying of foreign equipment to 20-year coal contracts. Will you explain, please, how you evaluated two recent turbine-generator bids in which you awarded a contract for one 600,000 kw unit to a domestic manufacturer for $30 per kw, and another to a foreign manufacturer for a 500,000-kw unit at $17 per kw?

Vogel: While we've had some adverse criticism, we've had much more expression of approval of what we've done. A direct comparison of the $30 and $17 costs per kw is an oversimplification. The GE bid on the 600,000-kw unit was the lowest evaluated bid, on a unit basis, for delivery at the time specified, in 1962. The Brown Boveri 500,000-kw unit award was based on the lowest bid for delivery in 1963. I believe we made the only choices open to us in so awarding the contracts.

Q. Would you say this represents a TVA effort to compromise—achieving some cost savings, and, at the same time, supporting American industry?

Vogel: Absolutely not. There was no attempt made at compromise. Our decision was made strictly on a business basis.

Q. In the past year, 27% of TVA's purchases were made abroad, more than in the agency's entire history. Do you expect this trend to continue or to accelerate?

'$50-75 million is within the range we are considering'

'Foreign competition is going to put us to the acid test'

'We must serve as a proving ground . . . for new ideas'

Vogel: That depends upon American industry. Let me make it clear that, as an American government agency, we are legally and psychologically committed to the wholehearted support of American industry. But we are now—more than ever—becoming extremely cost conscious. I believe American industry has not been as cost conscious as it should be. Your magazine last year pointed out the need for broad modernization for newer, more efficient production methods. American industry must tighten its belt; we are entering an era when foreign economic competition is going to put us to the acid test, and we'd better be prepared to meet it. One of the answers lies in giving the engineers in our great manufacturing companies a freer hand. We at TVA do not feel that our purchasing practices have been high-handed. We are merely conscious that we are big enough to help take a major pricing step to check inflation. We think American industry has the imagination and know-how to lick the wage differential *vis-a-vis* foreign competition.

Q. Sir, a federal grand jury is meeting in Philadelphia investigating "identical bidding" by electrical equipment manufacturers. Some of this bidding has been to TVA. Do you expect to be called in?

Vogel: Not personally. All we have done is to make available the bids we have been getting over a period of years. I don't think we will be called in.

Q. In this connection, Sen Kefauver has announced he will hold hearings into "identical bidding" in Knoxville after Congress adjourns. Have you been approached by his subcommittee about this?

Vogel: His staff has been in touch with ours. I have had no personal contact with them, and have no real information as to the ground to be covered.

Q. Recently, TVA asked for 20-year coal purchase contracts. As the nation's largest utility coal buyer do you think suppliers are able to realistically gauge prices 20 years hence?

Vogel: Our contracts include escalation clauses which take care of that. We have thus far received bids for five, ten, 15, and 20 years. Contracts for such periods are not uncommon for electric utilities.

Q. Isn't it true that you buy much of your coal from small, non-union mines?

Vogel: No. This is not true. We estimate that at least 90% of our coal comes from mines with union contracts or which claim to have such contracts. Of course, this is difficult to determine. We have no authority under law to differentiate between union and non-union mines. The main statute governing our purchases is the Walsh-Healey Act under which the Secretary of Labor specifies certain standards as to minimum wages, safety, and so forth. This act applies to purchases of $10,000 or more and covers over 92% of the coal we buy.

Q. Do you favor the idea embodied in Sen Neuberger's Columbia River Development Corporation Bill to create a basin-type authority in the Northwest? Do you think it a good idea for other U. S. basin areas?

'We'd welcome visits with private utility executives'

Vogel: TVA has its own job to do, and we do not try to tell other areas how to handle their problems. That is in the American tradition. Few, if any, other river basins in the United States are as admirably suited to a TVA-type approach as is the Tennessee Valley.

Q. General, some of your critics say they sense a change in your position since you first came to TVA. Whereas before they thought you might "throttle" the Authority, now they say you are for its unlimited expansion. Will you comment on this, please?

Vogel: Well, neither of those phrases truly describes my position. My record ought to indicate that I was never out to "throttle" TVA. As for its future "unlimited expansion", I assume you are thinking of territorial expansion. The bond bill clearly defines these limits. So far as I know, my position on the future of TVA is today the same as it was five years ago. I recognize it has a job to do and I will do everything possible to assist it to that end.

Q. General, in our previous interview, you mentioned that you hoped for closer working arrangements with other utilities, and a lessening of TVA's almost traditionally aloof position. Have you made any progress in that direction?

Vogel: Yes, I think so, especially on the engineering and operating levels. I should like to see more, however, on the executive level. We'd welcome a series of exchange visits with private utility executives.

Q. Sir, one last question. What plans do you hold for the future of TVA?

Vogel: In many ways the real task of TVA has only begun. I foresee a continuing role for it in developing new methods applicable to resource development in other nations and other parts of this country. We must serve as a proving ground—a testing laboratory—for new ideas. We are still far from having completed development of the upper tributaries of the Tennessee, and I need not tell you that we have a Herculean task in meeting the power demands of this virile region.

House Fails to Override Public Works Veto

Attempt is defeated by one vote. Senate may try to add identical provisions to the foreign affairs money bill

The Democratic majority in the House of Representatives failed on Sept. 2 to override President Eisenhower's veto of the huge $1.2-billion Public Works Appropriations Bill.

The vote to override was 274 to 138, one vote short of the required two-thirds margin.

Voting was split along party lines. Only eleven Republicans opposed the President. Only six Democrats supported him.

Interior Secretary Seaton has indicated that he would recommend as many as eight new starts next year, including Trinity River.

But the next move may come in the Senate, where Democrats may try to tack the identical provisions of the big appropriations bill (HR-7509) onto the end of the foreign affairs money bill—a measure strongly sought by the President.

Too Many New Starts

Eisenhower, as expected, balked at signing the appropriations bill for public works construction during fiscal 1960 because of the large number of new construction projects it contained. He pointed out in his veto message that inclusion of so many new federal projects "ignores the necessity for an orderly development of America's water resources within the nation's fiscal ability."

The President emphasized that the bill he vetoed provided an all-time record of $1.1 billion to continue work at projects already under construction, aside from the nearly 70 new starts. The new construction projects included by Congress in the bill would cost about $800-million to complete, Eisenhower pointed out, even though their first-year costs would be relatively low.

Federal funds to start construction of a power plant at Trinity Dam, Calif., were deplored by the President, but he added that, "if the Congress continues its refusal . . . to save $60 million of taxpayers' money through providing for construction of electric power facilities by non-federal interests, such new [appropriation] bill should of necessity include funds to provide for federal construction, since the dam is now being built and it is essential that power facilities be in place when the reservoir is full."

The President stuck by his guns, calling for a new appropriation bill from Congress to include no new starts. This was his position in his annual budget message last January, but Congress probably will insist on new starts.

"Overspending in respect to water resources is hurtful to the United States and to the proper development of these resources themselves," the President pointed out. "The unbudgeted projects [new starts] provided for in this bill will, at the proper time, make an important contribution to the economic development of the areas in which they are to be built and to the nation as a whole. But by any sound sense of urgency, these projects should not be started this year if we are to have a responsible federal fiscal policy."

Federal funds to continue work at federal projects already under construction will be provided—while Congress and the President wrangle over a fiscal appropriation bill—from temporary funds. None of these projects is expected to be stopped or seriously slowed down because of a delay in settling on the details of a permanent appropriation bill.

The bill Eisenhower vetoed included $500,000 to start construction at the controversial Burns Creek Dam, Ida., provided authorization is voted by the House of Representatives. Also, $450,000 was provided to start planning at Little Goose Lock and Dam, Wash., and $50,000 to start planning at Rampart Dam, Alaska.

In addition, considerable funds were included to build new federal transmission lines in western Iowa, part of the Missouri River Basin project, and in the Bonneville Power Administration's area.

Steel Strike's Effects Begin to Spread

Effects of the steel strike are beginning to spill over into other industries, according to Labor Secretary Mitchell, but the damage so far is "relatively mild."

There is a noticeable dip in electric power consumption in eight areas—Baltimore, Detroit, Kansas City, Syracuse, Cleveland, Cincinnati, Johnstown, and Pittsburgh—but this is attributed largely to direct loss of steel-making load.

Secondary effects are just beginning to show, but Mitchell feels that industries depending on steel will be hit harder after Sept. 15.

In Baltimore a producer of welding electrodes has been forced to suspend operations because of steel shortage. Several hundred workers in electrical machinery industry have been laid off in Pittsburgh, and some similar layoffs were expected in Johnstown.

Cleveland Electric Illuminating Co, although suffering from a decline in steel load, noted a pickup in industrial consumption at the end of August as plants reopened after vacations.

California utilities reported no secondary effects as yet, and Los Angeles Dept of Water & Power said that none were expected. Commonwealth Edison Co and Northern Indiana Public Service Co have seen no appreciable curtailments in industries since the steel plants closed down. Same story came from southern utilities.

First news of shortages affecting utility procurement came from Utah Power & Light Co. The company says that ACSR is no longer available in three-mi lengths, and that the use of lengths down to one mi is causing added expense in handling and splicing for transmission work.

Cornell Cable Tests Slated to Start Jan. 1

Contracts have been signed and construction started for the AEIC-EEI extra-high-voltage cable field testing program at Cornell University. The testing program is scheduled to get underway about Jan. 1, 1960.

Jointly sponsored by the Association of Edison Illuminating Companies and Edison Electric Institute with the cooperation of manufacturers of Hv cable and accessories, the project marks a major step in electrical industry research.

Objective of the test program is to evaluate mechanical and thermal performance and measure the losses of cable and accessories designed for 345-kv and 500 Mva under actual field installation and operating conditions. For economy, testing of the cables will be single-phase rather than three-phase.

It is expected that the first cable for testing will arrive at Cornell about Oct. 1. After Jan. 1, preliminary testing will take four or five months, and the regular testing schedule will begin about June 1, reports Project Steering Committee Chairman L. I. Komives, of Detroit Edison Co.

The field test program is expected to take three years. First two years will be used to see if these cables are suitable for U. S. power systems. The third year will be used to find ultimate capability of the underground cable circuits.

Four manufacturers are offering cables for test. General Cable Corp and Okonite Co will furnish pipe-type cables. Phelps-Dodge Copper Products Corp is offering high-pressure oil-filled cable with aluminum sheath. Anaconda Wire & Cable Co is submitting low-pressure oil-filled cable with lead sheath. All will be built according to conventional U. S. design.

Anaconda also expects to offer an experimental length of cable with synthetic insulation as a new approach to Hv cable design.

Excavation for the pipe, duct, manholes, and pothead stands has been underway since early July; and preparation of the grounds to contain the cable samples will be completed by Oct. 1 in time for installation of the first test cable.

New York State Electric & Gas Corp has completed a 23-kv circuit to the test site. Equipment needed for the testing station has been either secured or pledged by electrical manufacturers—mainly on a "no-charge" basis.

Participating manufacturers and service companies are: Evanite Plastic, General Electric Co, H. C. Price Co, Johns-Manville Sales Corp, Joslyn Mfg & Supply Co, Southern States Equipment Co, Underground Products of Livonia, Mich., W. A. Chester, Inc, and Westinghouse Electric Corp.

To date, $500,000 has been provided by AEIC, EEI, and individual utilities. The steering committee estimates that each of the four cable manufacturers will ultimately spend at least as much as the sponsoring utilities, and possibly more.

Cuban Rate Cut Kills A&FP Bond Sale

American & Foreign Power Co withdrew a $15-million issue of convertible debentures from the market Aug. 26, after its Cuban subsidiary had been ordered by the Castro government to slash its rates by 30.5%.

Although the issue had been oversubscribed, A&FP decided to give all buyers their money back. The company plans to try the financing again after the Cuban government's position is clarified.

The subsidiary, Compania Cubana de Electricidad, accounts for about 20% of A&FP's revenues.

Cuba's Council of Ministers acted on recommendations of the National Development Commission, which was named by the Castro government three months ago to study power rates. The cut is retroactive to Aug. 1 and reduces average kwhr cost from 9.35¢ to 6.5¢. It will reduce company revenues by an estimated $15 million a year.

Underwriters said that the cut, had it been in effect last year, would have turned the Cuban subsidiary's reported $5.9-million net income into a $3-million loss.

The debenture issue, called "Castro convertibles" by some on Wall Street, was handled by a syndicate headed by First Boston Corp and Lazard Freres & Co.

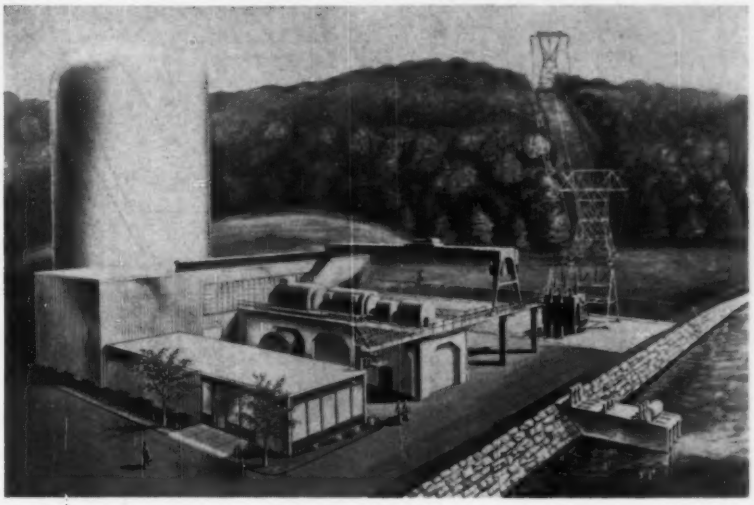
The replacement issue will be offered through the same underwriters as soon as circumstances permit, according to the company.

The incident marked the first time within memory that action of a foreign government had caused cancellation of an oversubscribed bond issue.

At the same time they ordered the 30.5% rate cut, the Council of Ministers also ordered A&FP to continue its $177-million Cuban construction and expansion program, $21 million of which is slated for this year.

Contracts Signed for 52-Utility Nuclear Project

40-Mw plant will produce 1,000-F steam at 1,450 psi. Completion due Oct. 1, 1963



40-MW NUCLEAR PLANT to be built by High Temperature Reactor Development Associates will be the world's first high-performance, gas-cooled system

The Atomic Energy Commission signed contracts Aug. 27 with Philadelphia Electric Co and General Dynamics Corp under which 52 utilities will build the world's first high-temperature, gas-cooled nuclear plant for central station power generation.

The plant is designed to produce 1,000-F steam at 1,450 psi.

Completion of the 40,000-ekw project is scheduled by Oct. 1, 1963. It will be located at Peach Bottom, Pa., in York County.

The plant will cost about $40 million. The utility group, High Temperature Reactor Development Associates, will bear the $24.5-million cost of construction. Philadelphia Electric will also provide the site and bear the cost of connecting the plant to its system. Net cost to the company will be about $1.2 million.

Westinghouse Electric Corp will supply the plant's electric generating system. General Dynamics will provide the nuclear steam supply system, including reactor and fuel elements for five years. Bechtel Corp will be engineer-constructor.

The reactor will be a helium-cooled, graphite-moderated, solid homogeneous system.

Elements Contain Graphite

Fuel elements in the core will contain a small proportion of enriched U-235 and a larger amount of thorium mixed with graphite in homogeneous carbon compacts.

The first core will be composed of metal-clad elements, which will limit steam temperatures to about 850F. The second core, however, will be made up of graphite-clad elements, allowing coolant temperatures up to 1382F and steam temperatures of around 1,000F.

Development of usable graphite-clad elements is a major goal of the program, and the graphite-clad core is the one described in the agreement with the AEC.

AEC agreed to waive charges on source and special nuclear material up to a maximum of $2.5 million, and will aid in meeting the costs of future research and development up to a $14.5-million ceiling.

'For Today's Steam Conditions'

Spokesmen of the utilities hailed the project as a step toward "nuclear plants designed to conform to modern-day steam conditions."

R. G. Rincliffe, president of Philadelphia Electric, and Robert E. Ginna, chairman of Rochester Gas & Electric Corp and president of High Temperature Reactor Development Associates, said that it would "point the way to a truly major advance in both the technology and economics of nuclear power generation."

In other atomic action:

• The Joint Committee on Atomic Energy reported out a bill authorizing AEC to make limited transfers of authority over atomic energy installations to states as they convince AEC they are prepared for the new responsibility.

However, the legislation—which probably will pass Congress before adjournment—specifically provides for continued federal safety control over such activities as nuclear power generation, waste disposal and import or export of nuclear materials.

Some key Congressmen have expressed fear that the bill, which was sponsored by JCAE Chairman Clinton Anderson (D-N.M.), will be used as a precedent for later transfer to the states of authority over power reactors, but AEC has indicated its own feeling that any such transfer is a long way off.

• The joint committee voted out a bill authorizing construction of a $105-million linear accelerator at Stanford University in California, after AEC assurances that an agreement calling for purchase of 9-mill power from the Pacific Gas & Electric Co will be reexamined.

Corrections

Two formulas in the article, "Statistical Sampling Guides Meter Maintenance," by C. V. Morey, in the August 24 issue were incorrect as published. The equations on page 50, column 3, should have appeared as follows:

$$n = \frac{(k^2+2)}{2} \cdot \left[\frac{K\alpha + K\beta}{K_{P^1} - K_{P2}}\right]^2$$

and,

$$\sigma = \sqrt{\frac{\Sigma X^2 - \frac{\Sigma X^2}{n}}{n-1}}$$

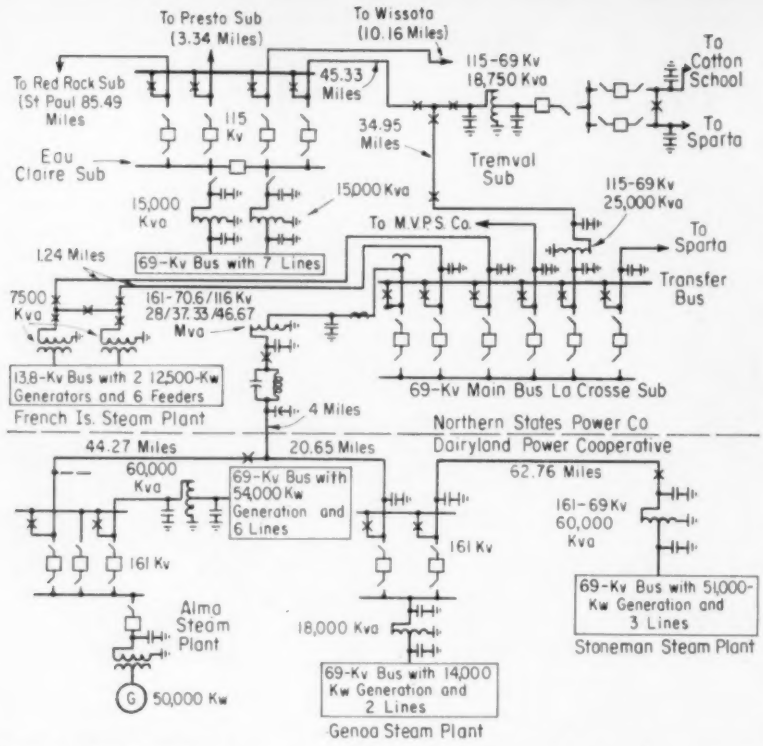


FIG 1—SUBSTATION is important tie in NSP system. Reduced-insulation transformer saves on investment cost and on losses. Its impedance also is lower

Reduced T

Improved arrester performance permits lower BIL transformers; savings in costs and losses proved worthwhile

A. C. KEMPPAINEN, Electrical Engineer, Northern States Power Co, Minneapolis

H. FOSSUM, Electrical Engineer, Pioneer Service & Engineering Co, Chicago

L. W. SCHOENIG, Transformer Dept, Allis-Chalmers Mfg Co, Milwaukee

Reduced-insulation transformers offer substantial savings which prompted their adoption by Northern States Power Co. These lighter and smaller units cost less initially and have lower losses, impedance, and noise level. They afford improved regulation and efficiency.

Reasons for using lower BILs are listed in Tables I and II. With full insulation, i.e. 750-kv BIL on the high-voltage windings and 550-kv BIL on the low-voltage windings, as a basis, reducing the high-voltage insulation one class, results in savings of about 10% in initial cost and 5% in losses. Reducing the high-voltage winding insulation one additional class increases the savings to 17% in initial cost and 11% in losses. If the high-voltage insulation is reduced two classes and the low-voltage windings one class, the savings are further increased to 24% and 16%, respectively.

For these reasons, NSP installed a 28/37.33/46.6-Mva, 161-70.6/116-kv, 3-phase autotransformer at the La Crosse substation. The latter is the key transmission substation where ties are established among the company's French Island steam plant, also in La Crosse, the 115-kv transmission from Eau Claire, Wis., the 69-kv transmission from the Mississippi Valley Public Service Co, and the 161-kv transmission from the Dairyland Power Cooperative. The substation supplies power to La Crosse and environs.

Feasibility Studied

This basically 161/115/69-kv substation has provision for 13.8-kv distribution, although the 115-kv bus has not yet been installed. Accordingly, the transformer has a 70.6-kv tap (350-kv BIL), giving a capacity of 12/16/20-Mva. Present transformation is 161-69 kv, the low voltage being fed into the 69-kv bus using a 69-kv line position.

A thorough study of the power system was necessary for determining the feasibility of using a reduced-insulation transformer. Maximum voltages were established so that transformer insulation could be coordinated with arrester protection. These conditions were studied:

1. Continuous normal voltages.
2. Continuous overvoltages.
3. Fault voltages.
4. Switching surge voltages.
5. Impulse voltages.

From these studies it was determined that 133 and 97-kv station-type arresters were suitable for use on the 161 and 115-kv systems, respectively. Protective levels of these arresters and transformer withstand levels of 750, 650 and 550-kv BIL for the high-voltage windings and 550 and 450-kv BIL for the low-voltage windings were plotted as shown. Guaranteed maximum voltage values for lightning arresters

Table I—Initial Cost vs Losses for Various BILs

BIL		Price (%)	Total Loss (%)
HV	LV		
750	550	100	100
650	550	90.5	95
550	550	83	89
550	450	76	84

Table II—Effect of Lower BIL on Size and Weight

BIL		Weights (%)	Dimensions (%)
HV	LV		
750	550	100	100
650	550	91	97
550	550	85	95
550	450	78	92

Transformer Insulation Pays Off

were used in plotting these curves.

From the curves in Fig 2, it can be seen that the use of 550-kv-BIL transformer insulation and 133-kv arresters allows a margin of 75-kv on switching surges (3,000 microsec). Margin is 100 kv on 20,000 amp IR discharge and 400 kv on a steep wave impulse (0.8 microsec). This represents a 21% margin on switching surges, 22% on IR discharge, and 94% on steep wave.

Using 450-kv-BIL transformer insulation and 97-kv arresters, the margin, as shown in Fig 3, is 85 kv or 33% on switching surges, 130 kv or 41% on 20,000 amp IR discharge, and 375 kv or 115% on steep wave. From these studies it became apparent that with 550 kv BIL for the high-voltage windings and 45-kv BIL for the low-voltage windings, the insulation would be well coordinated with the arresters.

Lightning and switching surge protection were therefore provided by 133-kv station-type arresters on the 161-kv side and 73-kv intermediate-type arresters on the 69-kv side. For future 115-kv operation, 97-kv station type arresters will be used on the low-voltage side. The arresters are backed up by rod gaps set at 29 in. on the 161-kv side and 20.6 in. on the 69-kv side. Grounding is by a conventional grid with driven grounds.

Transformer fault protection is by differential relays connected to bushing current transformers on the transformer high-voltage bushings and to the bus-side bushing current transformers on the 69-kv bank breaker. A 161-kv motorized disconnecting switch can isolate the transformer in case of differential operation or line faults. The 161-kv line relaying is by conventional impedance and carrier relays.

NSP has followed the practice for several years of using 450-kv-BIL transformer insulation and 97-kv lightning arresters on the 115-kv system. On the 161-kv system, 650-kv-BIL transformer insulation and 145-kv arresters have been used. As protection characteristics of lightning arresters have improved considerably, the use of modern 133-kv arresters provides adequate protection for the 550-kv-BIL transformer.

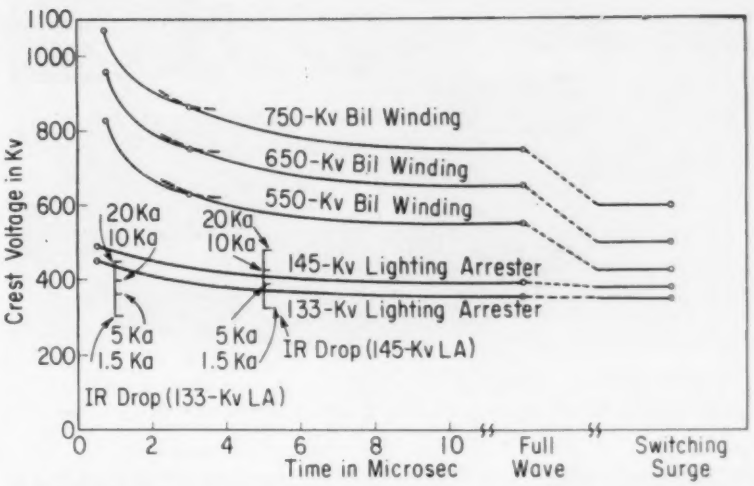


FIG 2—INSULATION COORDINATION is provided for transformer by lightning arrester performance. Arrester crest voltages are maximum guaranteed values

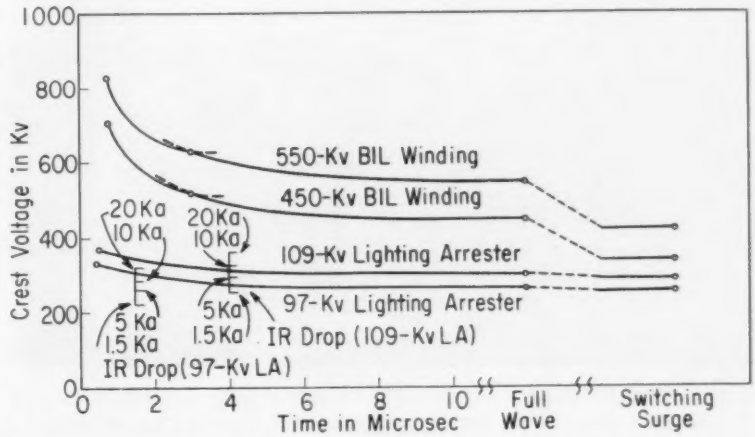


FIG 3—INSULATION COORDINATION MARGIN for Lv windings, using 450-kv BIL transformer and 97-kv arresters is 85 kv or 33%. Crest curves are as above

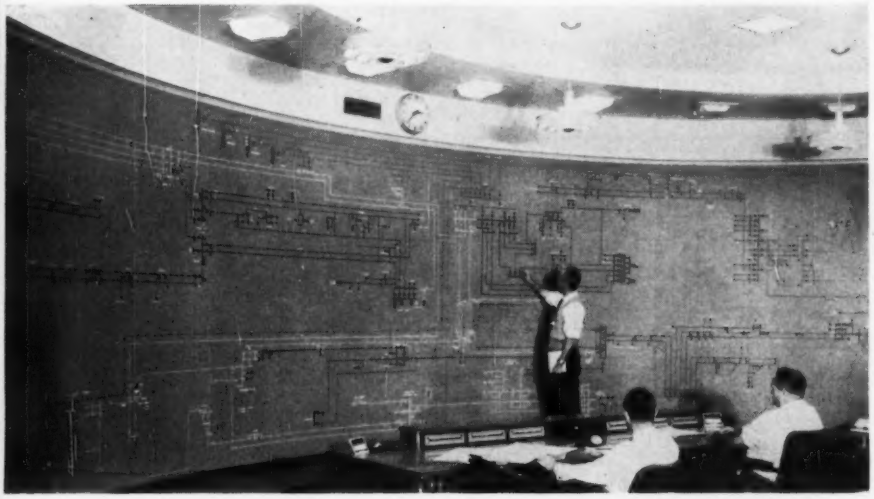
Table III—Lightning Arresters Characteristics Used in Study

(All Values are Maximum)

Arrester Rating	Critical Flashover	Front-of-Wave Sparkover	IR Discharge 1,500 Amp	5,000 Amp	10,000 Amp	20,000 Amp	*Switching Surge Sparkover
97 Kv	265	328	218	260	285	318	256
109 Kv	300	370	248	296	325	363	289
133 Kv	355	448	306	366	400	448	352
145 Kv	396	488	327	390	427	478	383

*Switching surge sparkover values were calculated as follows:
Arrester rating-kv × 1.8—Sparkover kv (RMS-Average)
Sparkover kv (RMS-Ave.) × 1.4 = Sparkover kv (Crest-Average)
Sparkover kv (Crest-Ave.) × 1.05 = Sparkover kv (Crest-max.)

SYSTEM OPERATING OFFICE at Shawinigan, Que., built along functional lines, accommodates load-frequency control, communications and telemetering



DISPATCHING OFFICE is circular in form, a design coming increasingly into use, and the system map follows the wall contours. Staff can view map conveniently

LOAD DISPATCHER is shown at console for load-frequency control. Telemetering panels with recording instruments are within easy observation

Operating C

Shawinigan operates system from building with functional design, modern communication and telemetering tools

R. F. BROOKS, Superintendent, Power Operations, Power Operations & Engineering Department, Shawinigan Water & Power Co, Shawinigan, Que.

A new system operating office, recently placed in service at Shawinigan, Que., by the Shawinigan Water & Power Co, is functional in design and provided with fully modern equipment. Replacing quarters in use for 20 years, it accommodates the centralized load-frequency control system, together with its substantially expanded communications and telemetering equipment.

The system operating office, reporting directly to the company's head office in Montreal, is responsible for water-storage operations and river regulation in cooperation with the Quebec Government Department of Hydraulic Resources. It allocates generation between plants, and is responsible for power interchange with other utilities, for the sale and supply of secondary energy to customers' electric steam generators, as well as for the broad coordination of operations throughout the transmission system.

A substantial growth in the company's installed capacity, transmission lines, and electric sales, together with advances in system operating equipment and procedures, made the new office a necessity. Shawinigan and its subsidiaries, Southern Canada Power Co, Ltd, and Quebec Power Co, today serve a 31,000-sq mile area, selling in 1958 about 9.5-billion kwhr with a maximum demand of 1,769 Mw.

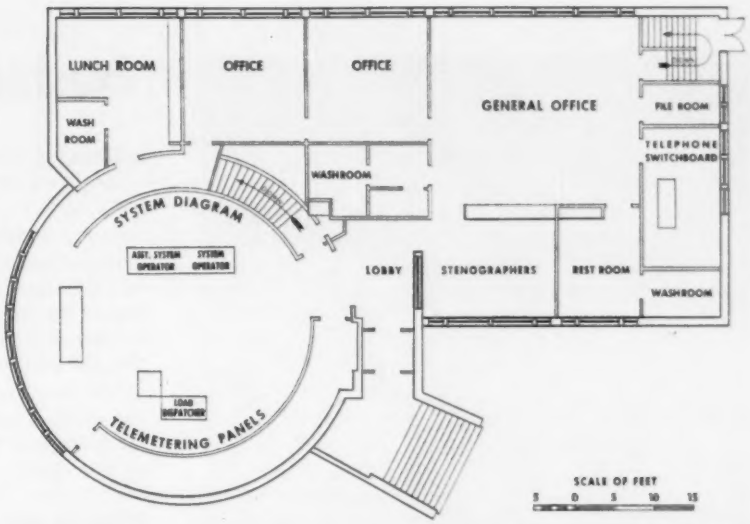
Shawinigan's installed generating capacity, entirely hydro, exceeds 1,500 Mw, supplemented by firm

Center Has Round Look

contract purchases of 400 Mw. The transmission system has 1,600 miles of 230 and 115-kv lines.

The system operating office building is designed to provide the maximum in facilities for the efficient functioning of the dispatching and supervisory staff. It was constructed by the Shawinigan Engineering Co, Ltd, a wholly owned subsidiary. Layout and facilities were based largely on company experience and the availability of new materials and techniques. It is a single-story building with full basement, and the total floor area, including the basement, approximates 7,500 sq ft. All personnel are on the level with control and communication equipment in the basement.

A striking feature is its circular dispatching office, where three members of the shift staff are on duty at all times. Along one side of the 42-ft dia dispatching office, the system operator and assistant are seated at a custom-built desk facing a wall diagram of the company's high-voltage system. The diagram, some 30 ft long and 10 ft high, follows the curvature of the wall and is constructed of perforated aluminum panels. Indicated on the panels are transmission lines, terminal stations, substations and generating plants. Additions for a continuously growing system can be made readily.



GROUND FLOOR PLAN shows that design makes maximum use of available space. All appurtenances are functional and modern, housed in modern building

Control Interconnection

On the opposite side is the dispatcher's desk and the console of the centralized load-frequency control which he operates. This equipment provides tie-line control of the interconnection between the systems of Shawinigan and the neighboring Quebec Hydro Electric Commission.

A measured indication of the net interchange between the two systems is telemetered to Shawinigan's system office. Simultaneously, variable-frequency type control signals go out from the office over power-line carrier circuits to the generating stations. These signals control the output of the generators at a level which maintains the required schedule of power interchange on the interconnection between the Shawinigan and Quebec Hydro systems. Up to five generating stations, comprising 27 units with a total capacity of about 1-million kw, may be used on control at the same time.

As an adjunct to the load-frequency control, recorders on the panels before the dispatcher give a telemetered record of the interchange on the various tie lines and the power output at Shawinigan's generating stations. A totalizing system is being installed.

The system operating office is also the communication center. Circuits radiate from the office to all parts of the power system via telephone and power-line carrier channels. The communication boards are unique in design. The installation consists of three automatic system operating positions, providing a separate board for each of the three men on a shift.

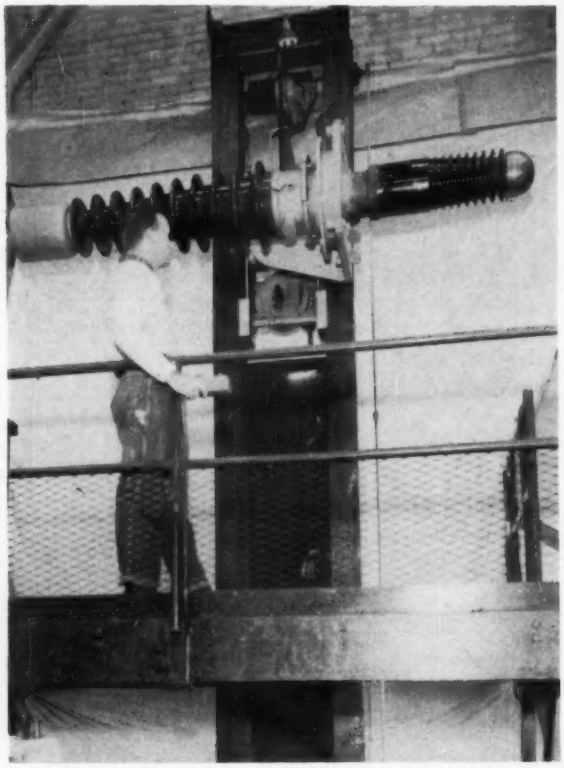
Each board has a capacity of 50 lines which may be used for outgoing calls by simply dialing the number of the circuit desired. Incoming calls are automatically indicated on the boards in front of the operators. The dispatching staff has full control over the circuits, being able at any time to take over any line for operating purposes.

The control room has both indirect and direct incandescent lighting, the combination giving excellent uniformity of vertical surfaces together with ample illumination of 60-ft-c on working areas. Desk tops and meter faces are glareless. To obviate interference, such as fluorescent lighting might cause to delicate radio and carrier-current equipment, incandescent lighting is used in the basement. Fluorescent lighting is used elsewhere.

Provide Two Power Sources

Power for the building is from two separate generating plants. The main supply enters the building at 2,300 v, 3-phase, and is transformed to 550 v, 3-phase and 208/120 v, 3-phase, 4-wire. The alternative or standby supply, provided at 550 v, 3-phase, is switched in automatically in the event of main-supply failure. A special emergency ac control supply is for operation of power-line carrier.

The building has a conventional concrete substructure, steel-frame superstructure, and brick walls. The relatively large window area, having thermopanes throughout, affords an abundance of natural light and gives an exceptionally pleasant and open appearance.



MANIPULATOR SHELF can be rotated in a vertical plane for convenience in working on bushing. Shelf runs on H-beams

Bushing Handler Adds C

LEONARD B. SMITH, Supervising Engineer, Equipment Coordination, Detroit Edison Co, Detroit, Mich.

Major bushing modernization program prompted Detroit Edison Co to build a device for handling and manipulating bushings while they are dismantled, assembled and rebuilt. Over 700 bushings have been modernized. They are rated 138 kv and operate on the 120-kv grounded-wye transmission system.

The manipulator consists of a horizontal mounting shelf, cantilevered from a motor-driven gear reducer to permit rotating shelf and bushing through a vertical plane. The mounting shelf can be raised or lowered between two vertical H-beams that act as tracks for the shelf. A 2-ton electric chain hoist adjusts shelf height to the most convenient position. The working platform is 8 ft above the shop floor.

Various sizes of adapters can be attached to the manipulator shelf and different sizes of mounting flanges for 115-kv and 138-kv bushings can be mounted on the adapters. A hydraulic loading device loads the springs that maintain the center clamping force which gives the bushing mechanical stability for circuit breaker and transformer applications.

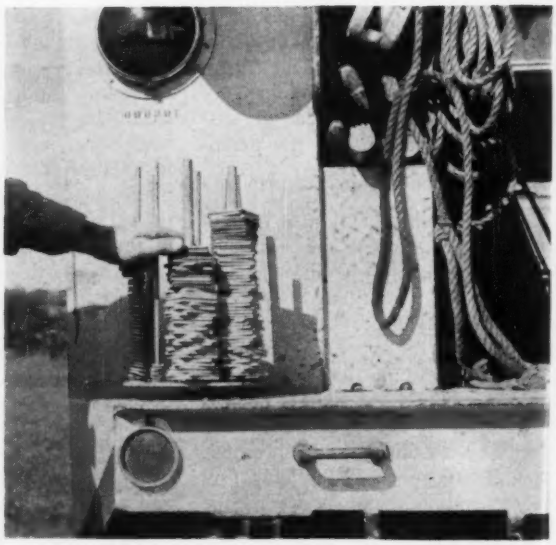
In the original modernization program, bushings were converted from the clamped-hardware to center-clamp form of construction. Some bushings have been rebuilt since the original program to increase

"Lazy Susan" Keeps Small Parts Handy

C. E. FETTER, Senior Foreman, Ohio Power Co, Mount Vernon, Ohio

A "lazy susan" puts square and round washers, lock washers, extra nuts and other small parts within easy reach for Ohio Power Co groundmen. It provides a quick inventory and parts do not bounce off while the truck is moving.

A revolving plate of ⅛-in. steel, 10 in. diameter has vertical pins welded on. The device encourages the saving of reusable washers after an installation has been disassembled. The few cents per washer saved will soon pay the $2 cost of the lazy susan, which is made from scrap material.



Convenience to Modernization Work

current-carrying capacities to meet system needs.

One manufacturer's bushings, rated 132 kv, 400 amp, compound-filled, were converted to 600-amp and 800-amp oil-filled type. The condenser core was re-stepped in accordance with manufacturer's recommendations and by replacing upper and lower porcelains and the center flange. An all-steel expansion chamber and 12,000-lb nest of springs for clamping were added; neoprene gaskets were used.

Oil filling permitted a 600-amp rating for bushings with brass conductor tubes and 800 amp for those with copper tubes. When 800-amp operation was required for a brass-tube bushing, a copper tube was installed inside the brass tube.

Subsequently, 1,200-amp ratings were obtained by adding sufficient copper to tube or stud and adding non-magnetic top and bottom members to the steel expansion chamber. The 800-amp rebuild has recently been abandoned in favor of the more economic 1,200-amp version.

Another manufacturer's bushings were rated 132 kv, 400 amp and 600 amp, oil-filled, with a free-breathing sight glass. The 600-amp bushings had non-magnetic parts.

These bushings were first modernized for both transformers and circuit breakers by replacing paper stress cylinders with phenolic cylinders and installing improved gasket material. To meet increased current and interrupting duties in circuit breakers, bolted-flange construction was abandoned in favor of center-clamp construction, and lower porcelains were used. The sight glass was replaced with an all-steel expansion chamber and a nest of springs for the 12,000-lb center clamping force. Gaskets are of neoprene.

To obtain an 800-amp rating for breaker bushings, a solid copper bar was inserted in the original copper tube. For transformer bushings, the original tube alone was used. This permitted continued use of a drawthrough lead. Later, the 800-amp bushing was converted to 1,200 amp by replacing the magnetic material in the top and bottom of the expansion chamber.

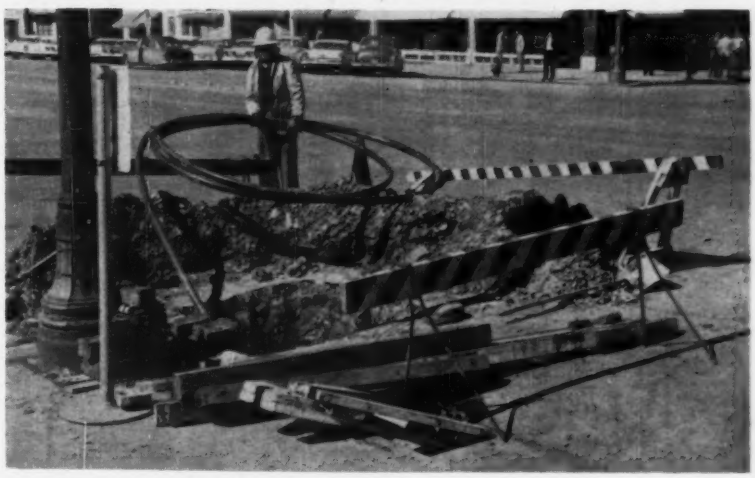
More recently, the 800-amp breaker bushing has been converted to a 1,600-amp rating through use of a non-magnetic expansion chamber and a fabricated non-magnetic center flange. The original 600-amp conductor tube and added copper bar installed for 800-amp service proved ample for 1,600 amp.

In addition to rebuilding and modernization, external porcelain has been added to 87 bushings to combat a serious contamination condition at a generating plant. Except for one type of bushing, extending was done by affixing a short piece of porcelain to the upper end of the original porcelains. For the one, new one-piece porcelains were used, with conductor tube extended to the extended length.

Flexible Conduit Cuts Installation Cost 40%

Plastic conduit has simplified the problem of installing cables for street lights and traffic lights on The Kansas Power & Light Co, system. Savings run up to 40% when doing the job with the plastic conduit compared with similar installations of metallic or fiber conduit. The flexibility of the plastic conduit makes it easier to handle and install on the job.

As the first step in putting in the conduit, 2½-inch mandrel is pushed under the street with a regular jacking machine. The plastic conduit then is pulled in as the mandrel is pulled out.



Unit Shutdowns in Light-Load P

Savings from transfer to newer, more efficient machines are substantial, despite start-up costs, Public Service E&G Co study reveals

C. J. **BALDWIN**, Advanced Development Engineer, Electric Utility Engineering Department, Westinghouse Electric Corp,

R. F. **DITTRICH**, Assistant Engineer, Electric Generation Department, Public Service Electric & Gas Co, Newark, N. J.

Shutting down unneeded generators during light-load periods saves on production costs. Nightly shutdown of units and weekend shutdown of others are economical, even when start-up costs are factored in. The savings come from the transfer of load from older to newer, hence more efficient, machines; they more than offset the cost of restarting the older units as the next peak approaches.

Such were the findings of a recent comprehensive study of shutdown problems. The study, made on the IBM 704 computer, sought to discover the optimum shut-down rules for generators of the Public Service Electric & Gas Co system.

Results of the study indicated, however, that the conclusions reached are no better than the cost data used, and that additional industry-wide work is needed in developing accurate cost data, particularly in the area of unit startup.

Much has been published on economic dispatch and on savings obtainable through operating generators at equal incremental costs. But no analysis has been available heretofore which can tell a system operator which machines to run hour by hour for the minimization of yearly production costs. He could load running machines incrementally, but had to rely on rule of thumb alone to run the right number.

In any hour the number of running units must be enough to carry the load and provide spinning reserve. Some systems also have area generation requirements. Units run for any of these purposes carry at least a minimum load, despite the fact that their incremental cost curves are well above those of other partially loaded units. Shutting down such units transfers their minimum load to more efficient units. Thus the incremental delivered power cost above the base cost is reduced, and the base or "no-load" cost of the inefficient unit is eliminated.

But the shut-down unit must be restarted when the next peak approaches, additional costs being then incurred. The decision to shut down a unit depends on these considerations:

1. The number of hours it can be shut down before it is needed again, i.e., the shape of the hourly integrated load-time curve for the period.

2. The cost of starting it up.

3. Its efficiency compared with the efficiencies of units left running.

A cost analysis of various shut-down policies enables the system operator to base his decision on an optimized rule which can be stated in this form:

Do not shut down a unit needed again for load or spinning reserve within H hours.

As the load curves used are hourly integrated ones, H hours is the period from the end of one hour to the beginning of the hour H hours later. For example,

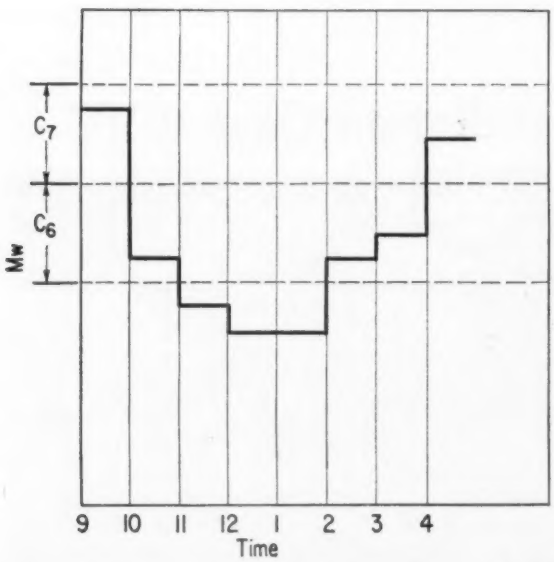


FIG 1—PART of a typical hourly integrated load-time curve illustrates the definition of a unit shut-down rule

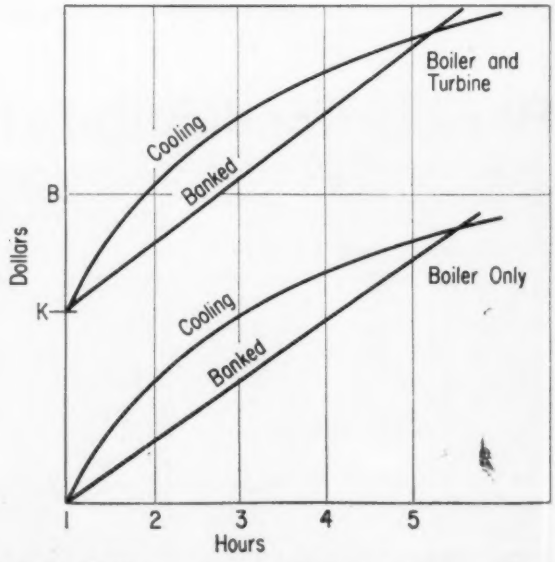


FIG 2—COST of starting up a boiler-turbine unit is shown here as a function of the time since the last unit shutdown

Periods Cut Production Costs

in Fig 1, Unit C_7 is shut down if its rule is H equals 6 hr or less. Unit C_6 is shut down if its rule is H equals 3 hr or less. A 2-hr rule is the lowest practicable, one hour being allowed for starting the turbine.

During any season the load-curve shape each week repeats itself essentially. Accordingly, an optimum rule for the season is determined by comparing production costs for different rules over a 1-week period. Thus the effect of lower weekend loads is included.

Start-Up Costs Needed

When a unit is shut down, there are alternative procedures. Either the boiler is shut down and allowed to cool, or the boiler is banked for the purpose of maintaining boiler pressure and temperature. Banking is more attractive when the unit will be required again in a short time because the costs are lower.

When a boiler is allowed to cool, its temperature drops exponentially with time, and the cost of restarting the unit is:

$$\text{Cost} = B\left[1 - e^{-\alpha(t-1)}\right] + K$$

where t is the hours during which the unit is shut down, B the cost of starting the boiler cold, K the cost of starting the turbine alone, and α the cooling time constant of the boiler (see Fig 2). As 1 hr is the assumed start-up time, $(t\text{-}1)$ is the time the boiler has cooled. The cost K includes the maintenance and operation cost due to the startup.

When a boiler is banked, a constant amount of fuel is fed into its furnaces each hour to maintain temperature and pressure, so that the cost accumulated at startup is

$$\text{Cost} = B'(t-1) + K$$

where B' is the cost in dollars per hour of banking the boiler.

The computer program calculates the weekly production cost by simulating the hour-by-hour dispatch of the system. Every time the program calls for starting up a unit, both of these costs are calculated, and the lesser is chosen as the start-up cost to be included in the total production costs.

Generating unit tests provide the start-up costs for the economic analysis. K, the fuel plus maintenance and operation cost of starting the turbine alone, has been found to be about equal to the cost of running the unit at no load for 1 hr. Other tests determine B' by measuring the fuel per hour necessary for banking, and B is computed by measuring the fuel needed to start a cold boiler.

The cooling time constant α is found from plots of boiler temperature following shutdown. All these costs have been computed for Public Service Electric & Gas Co units.

A cost analysis is complete when it includes running as well as start-up costs. Consequently additional data must furnish no-load, minimum load, and incremental cost figures for each machine. Maintenance and operating costs are included. Hourly production costs can be computed for any combination of turbine-generator units running from the figures for running costs.

For evaluating the economics of different shut-down rules, only hourly integrated load curves are needed in conjunction with the cost data. On the Public Service system, three typical hour-by-hour curves for weekdays, Saturdays and Sundays, such as appear in Fig 3, are enough to describe the different typical shapes for any season. The heating, cooling, and mild-weather seasons each shows slightly different characteristics in its three curves. Hence each may have different optimum shut-down rules.

The cost and load data are combined by the computer to find the start-up rules which give the lowest total system production cost. On the Public Service Electric & Gas Co system, the study showed that the lowest production cost is realized when the units are shut down whenever practicable, i.e., 2-hr rules are the optimum for both low-pressure and high-pressure units.

As units sometimes cannot be shut down as fre-

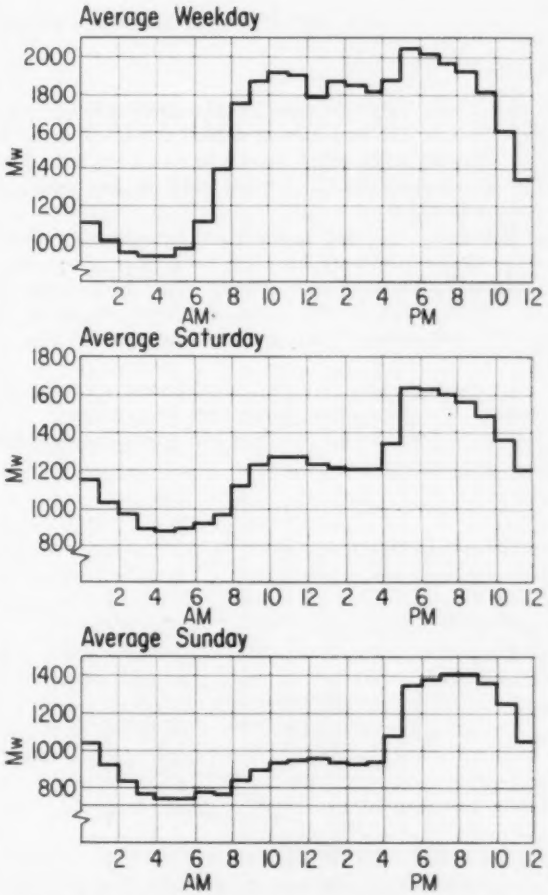


FIG 3—HOURLY INTEGRATED LOAD-TIME CURVES for December are for an average weekday, Saturday, and Sunday

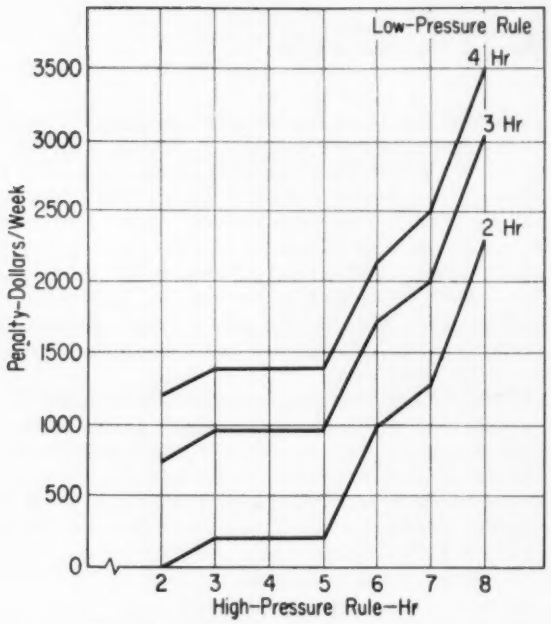


FIG 4—PENALTY in dollars per week are shown for average March week, using rules other than optimum shutdown rule

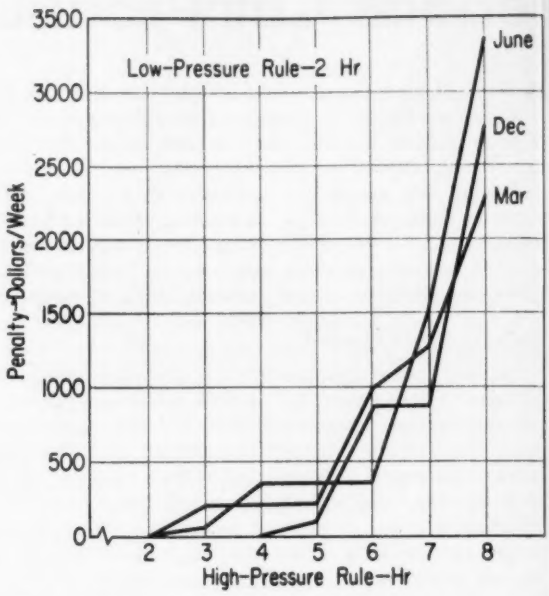


FIG 5—SEASONAL LOAD VARIATIONS have these effects on the weekly penalties, using rules other than optimum rule

quently as a 2-hr rule specifies, the study was extended to determine the penalties in dollars per week incurred by following rules other than 2-hr rules for both high and low-pressure units. Typical mild-weather penalties appear in Fig 4.

When a 2-hr rule is used for low-pressure units, rules up to 5 hr may be used for high-pressure units without undue economic penalty. This is apparent in the sharp break in the curve. Seasonal variations in penalty are shown in Fig 5 for a low-pressure rule of 2 hr.

Units on outage (see Fig 6), different spinning reserves, or other area protection requirements give similar patterns when penalties are plotted against the high-pressure rule.

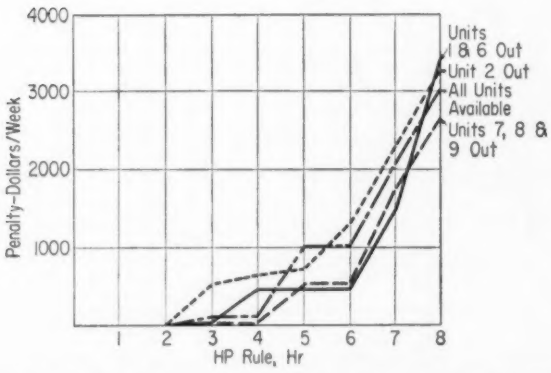


FIG 6—CURVES show the effect of various combinations of unit availabilities on the weekly penalties during June

Unit characteristics and costs of the Public Service system have been used in evaluating the optimum shutdown rules. Although the results pertain to a specific mixture of units and costs, they illustrate for operators of other systems the type of results obtainable and the relative importance of the many variables.

For the Public Service Electric & Gas Co system, the study shows that:

1. When units are loaded essentially in the order of efficiencies, the 2-hr rule is the optimum for both low and high-pressure units. Higher start-up costs favor longer rules. Yet, with start-up costs as much as double the values used, the 2-hr rule remains the optimum.

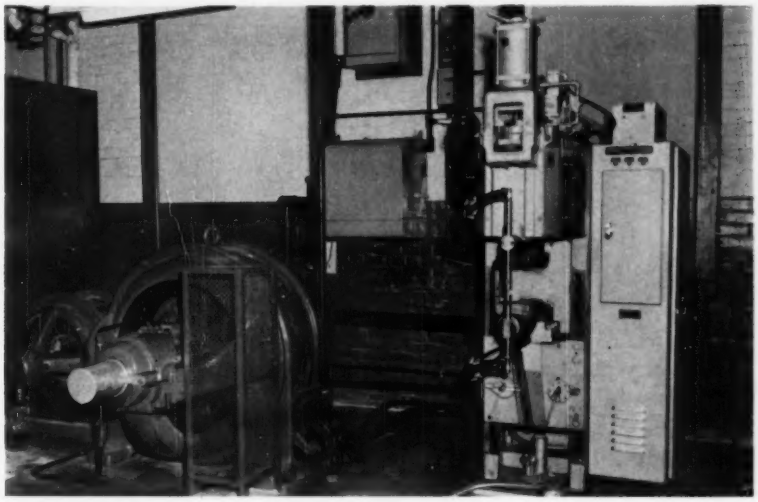
2. A high-pressure rule of up to 5 hr could be used without undue economic penalty, such as about $200 per week.

3. Seasonal differences in rule occur because of shifts from morning to evening peak. In the winter months, the evening peak being followed by a long period of low load, there is no penalty at all for using rules as high as 4 hr. As morning and evening peaks level off, shorter rules promise the benefit of the afternoon valley in the load curve.

4. When unit outages occur, the 2-hr rules still show lowest production cost. Nevertheless, the penalties for operating with longer rules show some variation which can be significant for certain units out.

5. Variation in spinning reserve does not alter the choice of the shorter hour rules for lowest cost.

6. If relatively inefficient units are operated continuously to meet area requirements, longer hour rules are favored, spinning reserve being held at normal value. For any set of requirements, the optimum rules can be determined.



Single-phase welder . . . served by high inertia generator . . .

Welds 16th-in. Aluminum Without Flicker

L. M. DURYEE, Division Sales Engineer, Connecticut Light & Power Co, Waterbury, Conn.

A practical solution to a tricky welding problem, plus a saving of $16,000 — these are the results of close cooperation between an industrial customer, a utility power sales staff, and an electrical repair shop in Waterbury, Conn. Pooling their knowhow, engineers of Connecticut Light & Power and the Electric Motor Repair Co came up with a power supply design that enabled the Bristol Co, a manufacturer of recording and indicating instruments, to install a new spot welder without an expensive investment in their distribution system. In addition, the novel system completely eliminates the voltage flicker normally caused by spot welding.

The single-phase spot welder, with a 75-kva nameplate rating, was originally installed to weld thin cross section aluminum parts. In investigating the power supply for the machine, it was found that the short circuit load with the electrodes closed could reach 293 kva. With a 240-v, single-phase supply, this would require a delivery capacity of 1,200 amp or a minimum of six 500,000-cm conductors within the plant. Since the welding department was on the second floor, about 300 ft from the main service entrance equipment, the investment would be about $20,000. Moreover, the 10-cycle welds could produce a serious voltage flicker problem. And an additional investment would be required if a second welder of similar capacity were needed in the future.

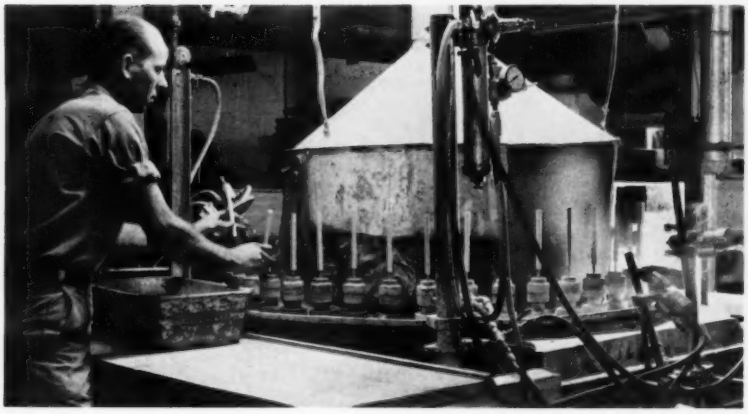
The power company recommended that Bristol purchase a large, heavy old generator which would have enough inertia to ride through the heavy welding loads. A two-phase, 180-kw, 240-v generator was located and a 50-hp, 240-v motor selected to drive it. The combination was installed adjacent to the welder. Total investment was less than $4,000 and no wiring changes were needed.

Almost immediately, it was found necessary to weld 1/16-inch thick aluminum pieces. By actual measurement, this produced a weld current of 24,000 amp, at 10 v, at the time of the weld. Welder reactance also rose with the current, making the kw input delivered at the welder jaws too low for satisfactory welding. Voltage at the generator terminals dropped to 150 v during the weld.

The generator excitation voltage was then boosted from 50 to 100 v dc. This boosted the generator output, delivered 300 v to the welder, and produced satisfactory welds. But the control equipment could not stand the 300 v when there was no weld current.

The final solution was to add an automatic resistor combination between the exciter and the generator, as well as in the shunt field. The 600-ohm rheostat in the shunt field and the 20-ohm resistor in the exciter circuit are connected to the contacts of a relay which is actuated by the welder pressure switch.

At the time of the weld, 300 v are obtained at the generator terminals. At the end of each welding cycle, the pressure switch trips the rheostat. This smoothes the voltage at the welder to a practically uniform 240 v. The installation has been entirely successful and permits regular welding of 1/16-inch aluminum parts.



With automatic glaze spraying and . . .

infra-red drying . . .

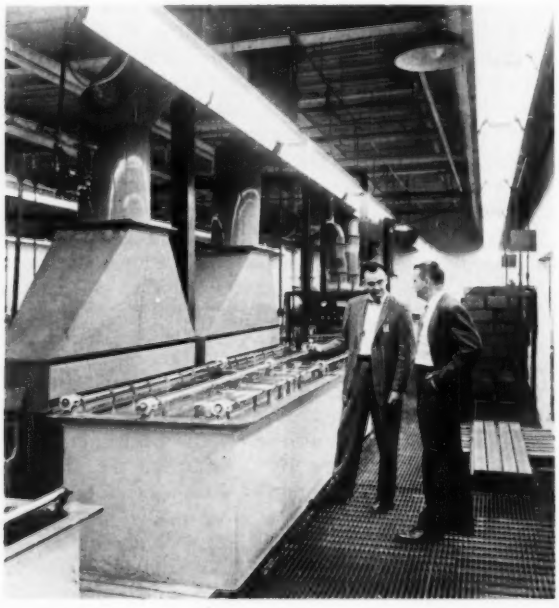
Ceramic Firm Improves Quality Control, Safety

DONALD B. PRIPSTEIN, Power Sales Engineer, West Penn Power Co, Butler, Pa.

Successful operation of a new rotary glazing machine was no surprise to the Saxonburg Ceramics Inc, Saxonburg, Pa. The results obtained from the earlier installation of electric kilns – which cut the reject rate on close tolerance ceramic parts from 25% to below 1% – had already proven the value of electric heat to them. The new glazer makes the kiln even more valuable.

After their first firing, the unglazed ignition tubes are placed on spindles on the glazer. They are carried around to a spray which automatically applies an even coat of glazing material. The tubes then travel past four 500-watt quartz infra-red lamps which dry the glaze quickly and evenly.

The glazed tubes are then run through the kiln, which fires the coating at 2,000 F. Control of the electric heat is so exact that warpage of the tubes is negligible. According to owner George Aderhold, the electric heat is not only safer, but also more accurate and dependable so that quality control is easier to achieve.



Production and Safety Improved By Lighting

GEORGE HOFFMAN, Industrial Power Representative, Baltimore Gas & Electric Co, Baltimore, Md

A new lighting system that quadrupled the illumination in the plating department is providing both the incentive and the means of turning out better work at the Bendix Radio Division in Towson, Md. Both shadow and glare have been reduced to a minimum by the new lighting. And the new installation has made housekeeping easier and promoted working safety in the plant.

Using continuous rows of fluorescent fixtures to replace the incandescent lamps previously used, the installation provides 50 to 60 foot-candles throughout the electro-plating area. Although the illumination has increased 300%, the consumption of electricity is only 50% higher than it was before the change was made.

New Lighting Improves Machine Shop Accuracy

CHARLES W. McQUISTON, Lighting Applications Engineer, Philadelphia Electric Co, Philadelphia, Pa.

High level illumination in the machine shop of the B & F Tool & Machine Co, Collegeville, Pa is paying substantial dividends in increased production and assured accuracy. Matching the new Illuminating Engineering Society standards, the lighting provides 100 foot-candles of shadowless light. This area is used for buffing, machining, and grinding tools for radio and television manufacturers.

The 48x65-ft area has 35 industrial type fixtures, each containing two 96-in., 800-ma fluorescent lamps. Fixtures are installed in continuous rows on 8-ft centers and suspended two ft below the 12-ft ceiling.

Photocell Assures High Light Level in Plant

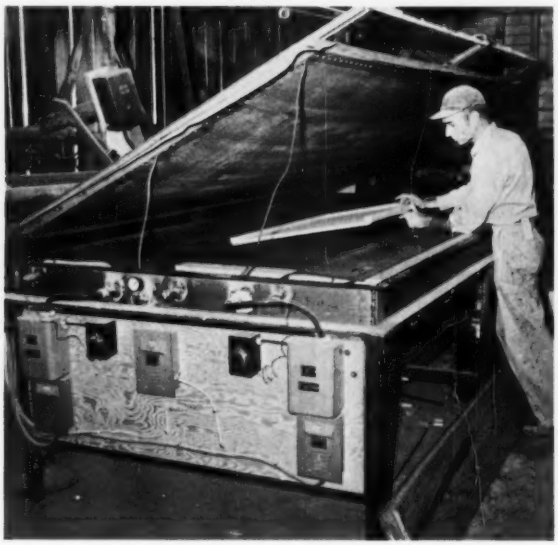
An automatic photocell system that turns on supplementary lighting as the natural light fails is an unusual feature of two new plant buildings of Hewlett-Packard Co, Palo Alto, Cal. To take full advantage of natural light, the plants use sawtooth roof construction, facing north. On bright days, work surfaces get better than 200 foot-candles, without glare.

When the natural light level falls below 175 foot-candles on the work surface, a photocell, located just inside one of the sawtooth windows, turns on half the plant lights. When the light level drops below 100 foot-candles, the other half of the plant lights are automatically turned on.

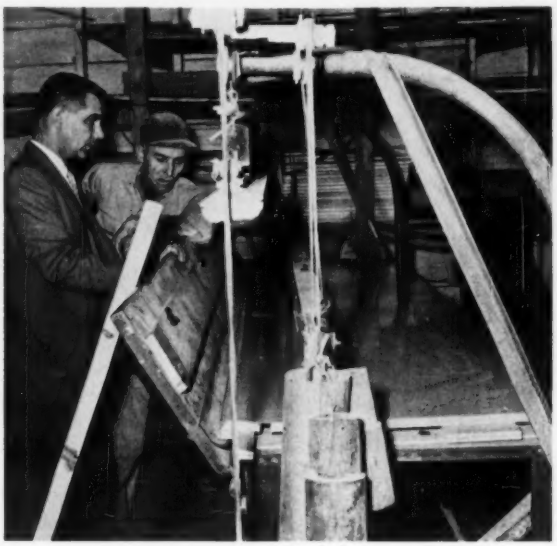
To keep the lights from constantly switching on and off when the light is changing rapidly, a half-hour delay is built into the control. The system also works in reverse, turning the plant lights off when natural light is sufficient.

What's Your Production Problem?

If you have problems in lighting, drying, casting, forging, painting, or materials handling, consult your local power company. Let their experienced specialists show you how to cut costs with electric power.



With vacuum drying press and . . .



electric coving equipment . . .

Electric Heat Cuts Job from Hours to Minutes

JOE ARNOLD, Commercial Salesman, Mississippi Power & Light Co, Greenville, Miss.

Turning out a 16-hour job in 9 minutes is no strain for efficient electric power. Proof of this is a new vacuum drying press, used in the manufacture of formica-type cabinet and table tops at the Rode Building Material Co in Greenville, Miss. Using electrically heated rubber drying blankets, the 13-kw vacuum dryer dries a cabinet top in 9 minutes, compared to 16 hours previously required.

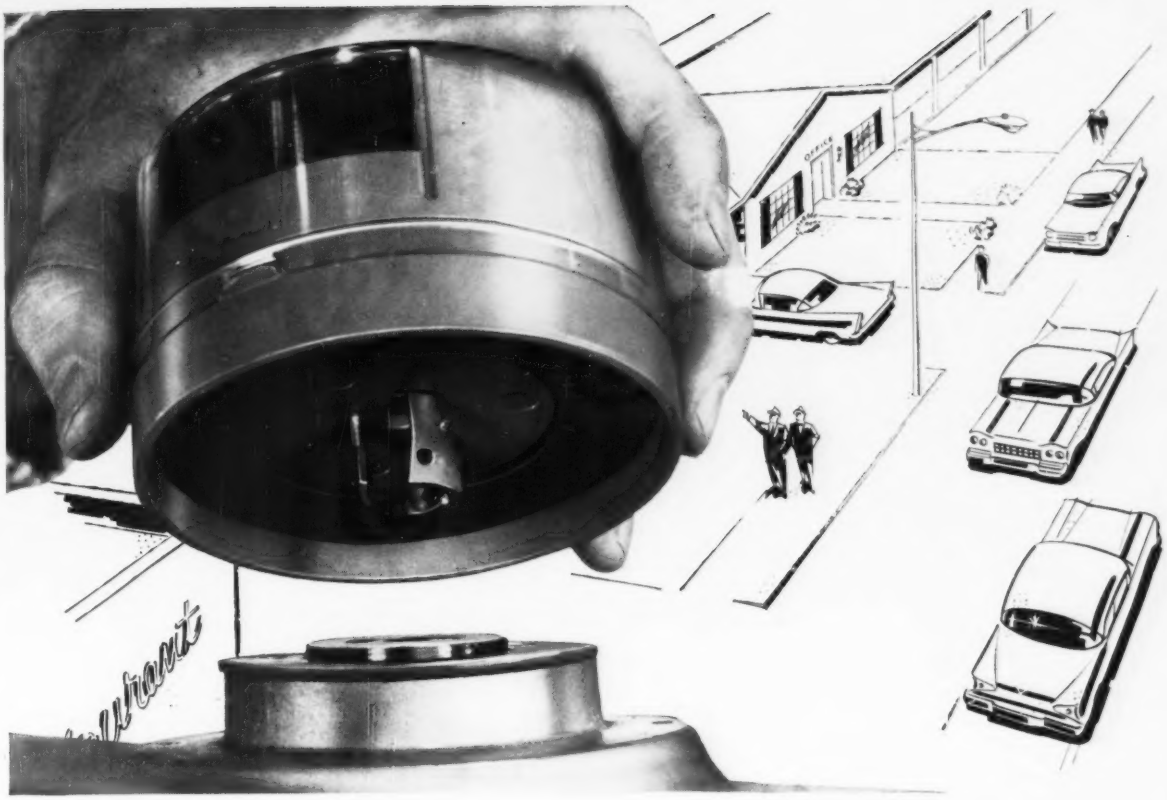
The cabinet tops are placed in the dryer after they have been formed and glued to wooden frames. The top of the dryer is clamped in place. A one-hp pump evacuates the air, drawing the top blanket down snugly over the part. This assures even contact and pressures during the drying process.

In addition to the dryer, Rode uses productive electric heat in other ways, too. Electric coving equipment, using 11 kw of electric heat, is used to soften the cabinet top material prior to bending. The long radiant heating element, suspended on pulleys, is lowered down to within a few inches of the material. A liquid material which melts at 300 F is placed on top of the area to be bent. As soon as it melts, bending is started. With the efficient electric heat, softening takes only 37 seconds.

Another electrically operated production tool is an edger, which dries glued edges with electric heat.

Lighting Assures Model Shop Efficiency

Modern lighting in the model shop of the Lionel Corp, manufacturer of the familiar Lionel toy trains, helps highly skilled employees work faster and better. Designed to provide 125 foot-candles of illumination, the lighting and the light colored walls and ceiling minimize eyestrain and absenteeism. The 28x73-ft room uses 60 fixtures mounted on 10-ft centers.



Reliable—after years of tests

New G-E cadmium-sulphide control installs in seconds . . . lasts for years

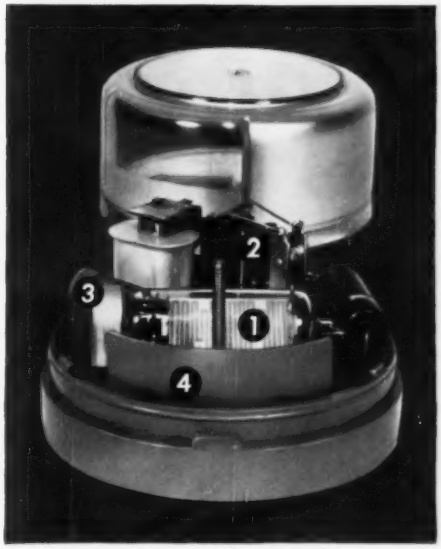
Now, from General Electric comes the industry's newest, most dependable cadmium-sulphide photoelectric control. Years have been spent in the research, design, and testing of this new street lighting control to produce the most efficient, most reliable cadmium-sulphide control available. Now, after exhaustive testing, the reliability problem has been solved with a custom-built General Electric cadmium-sulphide cell. Shock, surge, humidity, vibration, load, temperature—these were among the tests conducted —but none was found to alter the dependable performance of the new G-E control.

Addition of the new cadmium-sulphide cell is but part of the story. General Electric has developed a new, simplified circuit with specially-engineered long-life components . . . designed and built to work together and to reduce your control costs.

Get the full details from your General Electric Apparatus Sales Engineer or Agent, or write Section 450-25, General Electric Company, Schenectady, New York.

Progress Is Our Most Important Product

GENERAL ELECTRIC



ADVANCED DESIGN FEATURES give: (1) dependability from new G-E hermetically sealed cadmium-sulphide cell; (2) long life from specially-engineered components; (3) built-in protection from voltage surges; (4) power savings through accurate external adjustment. NO VACUUM TUBES OR RECTIFIERS.

Before you buy another

transformer... **CHECK SERVICE**

General Electric ships in 24 hours within the U.S.A. ...also rebuilds, repairs, and uprates

You cut distribution transformer inventories when you take advantage of G.E.'s fast delivery. No need to keep dollars on your shelves or to spend needlessly on warehouse handling and storage. General Electric has more than one hundred district warehouses, backs them up with extensive factory stocks, and offers you 24-hour shipment when needed.

Overnight shipment is only part of General Electric service. Service Shops—48 of them—put emergency repair service within convenient geographic range; these facilities prove their worth especially in times of flood, fire, and storm. Other service includes repair and uprating of your old transformers as well as technical advice on product or system problems.

Before you buy another distribution transformer, check service—give your transformer manufacturer credit for the extra values he gives you. General Electric Company, Schenectady 5, New York. 431-79

Progress Is Our Most Important Product

GENERAL ELECTRIC

GIVE YOUR TRANSFORMER MANUFACTURER CREDIT FOR THE EXTRA VALUES HE GIVES YOU		G.E.	OTHER MFRS.			
MEASURE LOAD BUILDING—do Co.'s other products build load? Does Co. sponsor load-building programs?						
CHECK SERVICE—24-hour shipment? repair and uprating? emergency assistance?						
COMPARE FEATURES—how many exclusive features in terms of longer life; reliability; easy maintenance?						
ANALYZE PRICE—does Co. hold line against inflation with significant product developments?						
EVALUATE INNOVATIONS—has Co.'s research paid off for you? Recent examples?						

FILL IN THE BLANKS . . . See which manufacturer gives you more for your transformer dollar: Mark "X" for a measurable contribution, "O" for insignificant contribution.

SOUTHERN ELECTRICAL'S GROWING FAMILY OF

Compresto® Cables

From Southern Electrical Company's engineering laboratories, which developed "COMPRESTO" cable for the electrical utility industry, comes a NEW member to the "COMPRESTO" family, **19 WIRE COMPRESTO.**

NOW AVAILABLE — IN COMPRESTO

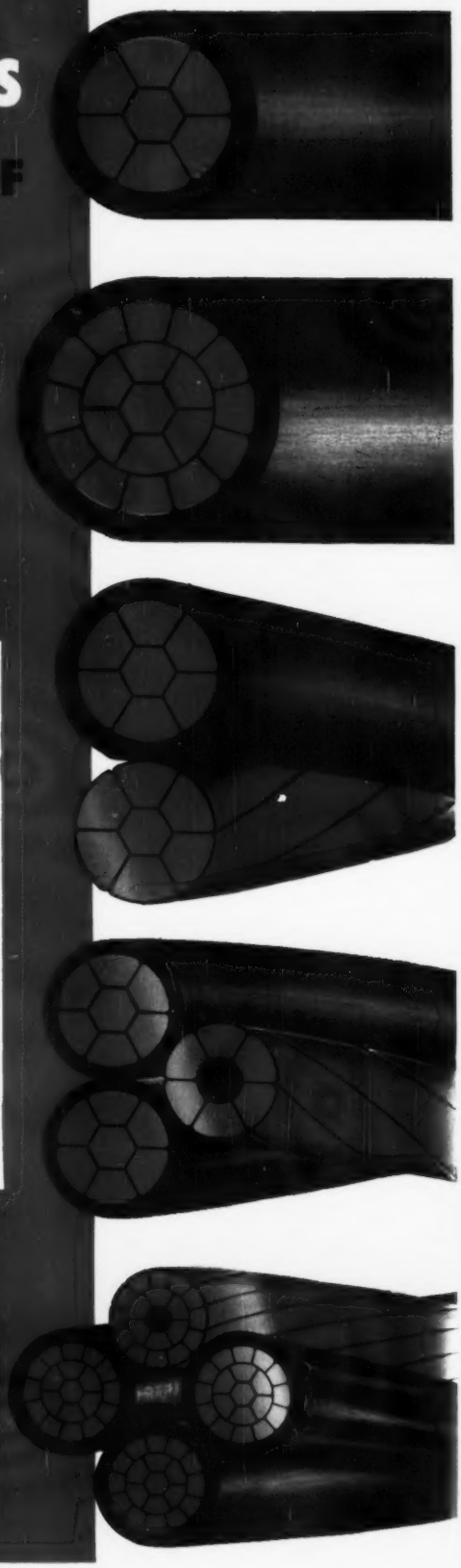
19 wire All aluminum conductors — sizes up through 336, 400 CM

18/1 ACSR Conductors — sizes up through 336, 400 CM

Available with,
NEOPRENE, POLYETHYLENE or TWO COAT INSULATIONS

Available as,
COVERED LINE WIRE, DUPLEX, TRIPLEX and QUADRUPLEX

Developed for the growing need of secondary service cables.



Southern Electrical Company

CHATTANOOGA, TENNESSEE

METALS DIVISION

OLIN MATHIESON Chemical Corporation

Periodic Ground-Line Treatment Reduces Pole-Line Costs

Years	If pole life is extended 100%, outlays add up thus:		If pole life is extended 50%, outlays add up thus:		Without ground-line treatment, outlays add up thus:	
0	Install new pole	$100	Install new pole	$100	Install new pole	$100
15	Treat pole	10	Treat pole	10		
30	Treat pole	10	Treat pole	10	Replace pole; transfer equipment	300
45	Treat pole	10	Replace pole; transfer equipment	300		
60	Replace pole; transfer equipment	300	Treat pole	10	Replace pole; transfer equipment	300
75	Treat pole	10	Treat pole	10		
90	Treat pole	10	Replace pole; transfer equipment	300	Replace pole; transfer equipment	300
105	Treat pole	10	Treat pole	10		
Accumulated outlays, 105 years		$460		$750		$1,000

Pole Treatment Cuts Line Costs

Pole preservation program gains urgency as best timber declines in quantity, quality, and resetting costs mount

FARQUHAR W. SMITH, Consulting Engineer, Richmond, Va.

A program of pole preservation is a utility company necessity today, when first-class pole timber is declining in quantity and quality, and no suitable substitute material for wood is in sight. Such a program is all the more urgent because the average cost of resetting a pole increases as the newer conductors, transformers, and other pole items become heavier and the wider use of higher voltages demands more hot-line work. This article considers particularly the pressure-treated Southern pine pole for which historical records are available.

An executive, planning a program of pole treatment for his company, deals with an important segment of his company's operating expenditures. The plant account for poles, towers, and fixtures (FPC #354) is about 20% of the total distribution outlay, and in most companies the major part of this account is for poles.

Today a 40-ft pole in place costs about $100. This is the unit cost of the common distribution pole, suitable for joint use by power and communication companies. The cost of attachments is not included. Throughout the United States there are many millions of such poles, so many in fact that reliable records of ownership and use do not appear to be available. At a rough estimate, there is about one pole per customer for an electric company serving cities, towns, and rural areas—the total coming to about 50 million.

The average cost of resetting a pole is difficult to estimate. A rural pole needs only simple rebuilding. But a junction pole in a city street may involve more than a $1,000 outlay in materials, equipment, and labor for the transfer of fixtures. The costs of resetting go up as conductors and transformers, and other items become heavier, and today's higher voltages increase the hot-line work. For the purposes of this article, $200 may be considered the average cost of transferring fixtures from an old to a new pole.

These are all factors the planning executive must take into account, placing beside them the contract cost of inspecting and ground-line treating a pole. This is only $6. Adding to this the cost of checking pole records and field conditions, and establishing additional pole data, the total comes to no more than $10.

Accordingly, his decision to proceed should be based on the number of poles and on whatever information is available on their age. Because of the number of poles involved in the program, he should consider complete record keeping, often with the aid of tabulating equipment. He should also be mindful that experience indicates that the first re-treatment of a pole should be carried out when the pole has been in use about 15 years. All poles to be inspected and/or treated should be listed.

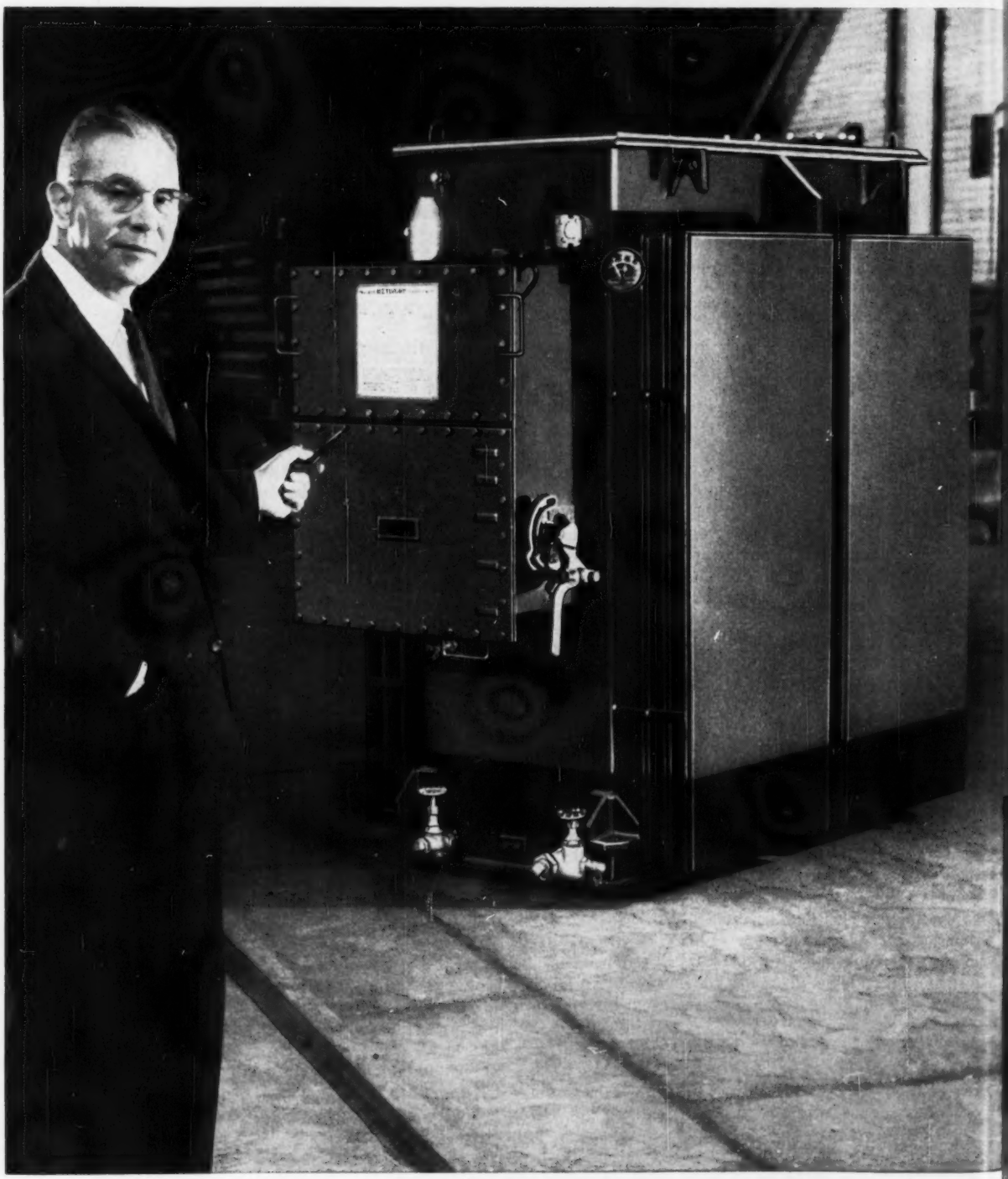
As most pole failures are at or near the ground line, a thorough ground-line treatment program is an important means of postponing decay and prolonging a pole's useful life. The effectiveness of such treatment depends upon full-length inspection of the pole, on the chemicals employed, and on the skill and consistency with which field work is conducted.

Pole-destroying organisms can be exterminated by two methods. One is the Osmose treatment which involves wrapping the pole. Another is the Cobra treatment, in which chemicals are injected. Both employ water-borne salts and, when desired, penta. Creasote is best reserved for treating the disturbed earth at the pole.

A program of pole treatment can be carried out by company gangs. Or it can be carried out by contractors. Once an experienced and reliable contractor has been selected, the company should leave the supervision of all treatment work to the working foreman. The

(*Continued on page* 104)

Built for close quarters...



Wagner Network Transformers

are small in size... have compact switch... feature panel radiators for smoother contour

Wagner network transformers are designed to give you smaller, lighter units, with smoother contours for easier maintenance. You can cut network system costs by using smaller vaults with these space-saving transformers—or you can put larger ratings in your present vaults. You save on maintenance, too. The panel type radiators are easy to clean, and an anti-corrosive tank finish protects exterior surfaces for years, under the adverse conditions of underground installation.

NEW WAGNER-DEVELOPED ROTARY SWITCH ... The rotary type, liquid filled high voltage switch was designed especially to meet the requirements of network systems—it is smaller in depth than previously used knife-blade type switches.

LOWER NOISE LEVEL ... Improvements in core design and materials, and newly developed methods of treating the core steel have made lower noise levels a feature of all Wagner transformers.

Constant research and development have kept Wagner up front in transformer design for more than 65 years—made the name Wagner one of the foremost in power planning.

For expert advice in solving your network transformer problems, consult your nearby Wagner Sales Engineer. There are Wagner Branches in 32 principal cities.

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

Wagner Electric Corporation

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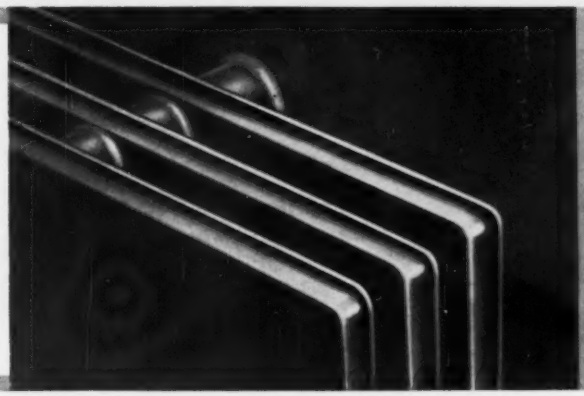
WT59-7

NEW PANEL-TYPE RADIATORS

New design radiators have smooth vertical surfaces with far fewer places where corrosive moisture and dirt can accumulate. They're easy to keep clean. Reliability is improved because there are fewer places for leaks to develop.



SERVING 2 GREAT GROWTH INDUSTRIES... *ELECTRICAL... AUTOMOTIVE*

Characteristics of Three Mercury Ballasts

Operating characteristics and circuits are outlined for three types of integral ballasts used with mercury vapor lamps for outdoor lighting

J. S. **LINDSAY**, Outdoor Lighting Dept, General Electric Co, Hendersonville, N. C.

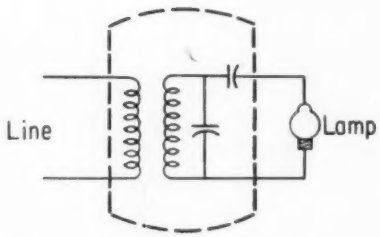


FIG 1—REGULATOR BALLAST, a present popular type, is a multi-winding, reactive, insulating transformer. It provides starting voltage required for lamps when temperature is down to —20F. Lamp current is kept constant

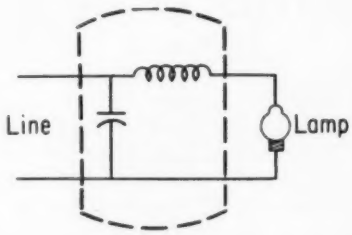


FIG 2—REACTOR BALLAST has a single winding on a core. A capacitor may be added across the line for power factor correction. These reactors are economical where voltage and temperature limitations can be met

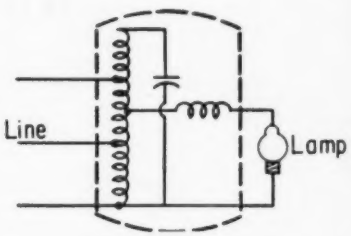


FIG 3—LAG BALLAST is a multi-winding, reactive, autotransformer with line voltage transformed to suitable starting voltage. No regulating function is performed. Power factor provided on primary winding

		Regulator Ballast	Reactor Ballast	Lag Ballast
Available Voltages		100–130 v 200–260 v 400–520 v Can be made for any voltage up to 600 v	Can only be made in limited voltage range for each spec. lamp. Most common reactors are: 100 w 240 v 175 240 250 240 400 240 425 480 700 480 1000 480 Only slight variations are possible (277 or 460 v for example)	110/120/220/240/460/480 Can be made for any voltage up to 600 v
Tap Selection		Not required. One tap setting provides range of ± 13% variation in primary volts	None usually. Input line voltage should be within 5% of primary rating	Tap must be selected within 5% of line voltage
Variation in lamp watts with changing primary volts	±5% voltage change	± 1%	± 8%	± 8%
	±13% voltage change	± 1% to 2%	± 20% (not satisfactory)	± 20% (not satis.)
Relative Price		100% (same as Lag)	Approx. 65%	100% (same as Reg)
Power Factor		Always high, above 90% with capacitor part of regulating circuit	Usually high, above 90%. Capacitor could be omitted	Usually high, above 90%
Watts Loss		Approx. 12%	Approx. 6% to 8%	Approx. 12%
Maximum allowable dip in primary voltage that will not extinguish the arc		50%	20%	30%
Inrush Current		Slightly less than normal line current	Approx. 2 times normal line current	Approx. 2 times normal line current
Maximum loading on 30-amp switch		400w— 6 amp 250w— 9 amp 175w—12 amp	400w—4 amp 250w—6 amp 175w—6 amp	400w—4 amp 250w—6 amp 175w—6 amp

Let's take a closer look at Demand Metering . . .

Why Call it Demand?

Does the word "demand" make you bristle?

While we all know that demand charges are fully justified from the standpoint of basic economics, the electric power customer often fails to realize that it is he who is making demands on the utility rather than the other way around. If psychology has a place in rate-making, should the word "demand" have ever been admitted to the electric utility vocabulary?

Today, when demand metering is being applied to the measurement of more and more residential loads, seems to be a good time to reconsider our use of the word. Electric customers, tabbed with a *demand* charge on their electric bills, have a tendency to bristle at the term.

If we remove *demand* from demand metering, it becomes a more acceptable concept . . . and if we substitute a logical and less offensive word in its place such as load, peak, or power, we have a more readily understood term.

What's your suggestion? We would like to hear from you. Address Glenn M. DeKraker, Sangamo Electric Company, Springfield, Illinois.

Acknowledged Leadership in Demand* Measurement

Sangamo offers the most complete line of demand measuring devices in the industry —equipment to indicate and record demands from the smallest values to the largest encountered by the electric power industry. The line includes singlephase and polyphase mechanical demand registers, thermal demand meters, indicating and graphic meters, digital demand recorders and translating systems for Kw, Kvar, and Kva demand. You can look to Sangamo for all types of demand devices.

*Until you change the term "demand".

JH59-3

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

Do you use THERMAL DEMAND?

The compact singlephase or polyphase Sangamo watthour and Lincoln demand meter combines the new features of Sangamo's watthour meters and Lincoln watt demand meters. These meters are calibrated at the factory to 1% of full scale.

Accuracy assured by carefully matched components that are completely shielded. Only two moving parts assure minimum maintenance.

Where future load growth is anticipated, capacity of the demand element can be doubled by changing two link connections and the demand scales.

. . . OR DO YOU PREFER

MECHANICAL DEMAND . . ?

Sangamo's new Type D mechanical demand register, when installed on any of the Sangamo extended range J2 and P2 watthour meters, gives the most accurate indicating demand measurement available. You get 1% full scale accuracy.

The heart of the demand register is the motor. With over two million Type H motors in service, it offers proven reliability in addition to higher torque, slower speed and higher insulation levels.

Universal and standard Type D registers were designed to give better disk visibility, better service accuracy, time interval indication, and simple disengagement of timing motor for register checking.

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

50TH ANNIVERSARY SANGAMO 1909-1959

INVENTORIES ▶ **Steel and copper inventories of major manufacturers** are still at a safe level. GE says it is not now faced with any steel shortages and, more specifically, that turbines will be shipped on time through December. Westinghouse says it still has a 60 to 90-day supply of steel with no soft spots developing yet. A-C has enough steel to last through September. Copper is still plentiful with all three.

FINISHES ▶ **Pennsylvania Transformer announces a new finish** for distribution transformer and regulator tanks—called "V.I.P. Finish"—that is said to be twice as effective as the previously-used finish. The company is now using it on its Pole Star line.

Line Material is conducting evaluation tests on a new plastic-coated distribution transformer designed for use in coastal areas. Successful one year tests have been completed in Ohio and Florida; Pacific coast tests are now in progress.

COMPETITION ▶ **Watch for increased and closer competition here between the American and foreign manufacturers.** Last week, Balwin-Lima-Hamilton apparently underbid English Electric for three 48,300-hp hydraulic turbines for TVA. B-L-H points out that their low bid was predicated on the procurement of a substantial amount of labor and materials overseas. Worthington Corp says in a booklet to their management employees that the key to job security in the face of aggressive foreign competition is not restrictive measures that frustrate world trade. "Rather, the answer lies in the ability of American industry to remain competitive in design, quality, cost and price with foreign manufacturers." And both GE and Westinghouse cite foreign competition as one of the reasons behind their recently-announced modernization of steam turbine production.

BUYING POLICY ▶ **Which factor is most important to purchasing agents** in the selection and purchase of equipment? Product performance and efficiency, with price second, according to a sample survey conducted by Electrical World. Service, including application and design engineering, is third, followed by utility relationship with manufacturer. Last is prodruct innovation. But with equipment where prices are often identical, the other factors assume more importance.

OTHER PROCUREMENT NEWS

News of Manufacturers . . . . . page 72

New Equipment . . . . . page 82

Readers Service . . . . . page 84

Electrical Equipment on Order Hits 4-Yr Low

Survey of the Edison Electric Institute, N.Y.C., as of July 1, 1959, summarizes the outlook for the use and manufacture of heavy electrical equipment: 1) Total electrical energy output for '59 will be approximately 10% more than in '58, barring major upsets in the national economy resulting from the current steel strike or other causes; 2) About 52% of the 14,176,725 kw scheduled for '59 had been placed in service as of July 1, exceeding about 60% the '58 figure; 3) manufacture of certain classes of heavy power equipment continues at a relatively high rate as orders placed some time ago near completion, and 4) total capacity (1959 through 1962 and later) on order and scheduled for shipment is 20.8% less than on July 1, 1958, and lowest since 1955.

Large generating equipment covered in the survey includes that which is on order, or in some cases, under negotiation with the manufacturer. Data concerning schedules and shipments of steam generators are given in terms of shipment of the principal pressure parts, on hydraulic turbines in terms of embedded parts.

The data include shipments on order and scheduled for shipment and equipment in operation for the years 1959 through 1962 and later.

Elec. Equipment Scheduled and Shipped 1957 and Later

	Shipped		Shipments Scheduled as of July 1, 1959				
	1957	1958	1959[c]	1960	1961	1962 and later	Total
STEAM TURBINE-GENERATORS (4,000 kw and larger) (Mw)							
U. S. El. Pr. Sys.[a]	10,283	13,993	10,674	8,533	5,298	1,347	25,852
U. S. Indl.[b]	1,454	216	166	545	....	....	711
Outside U. S.	772	1,244	1,686	406	....	....	2,092
TOTAL	**12,509**	**15,453**	**12,526**	**9,484**	**5,298**	**1,347**	**28,655**
STEAM GENERATORS (450-psi pressure and higher) (Thousand lb/hr)							
U. S. El. Pr. Sys.[a]	95,184	97,826	75,513	35,603	11,825	1,500	124,441
U. S. Indl.[b]	26,166	11,746	6,473	6,771	....	650	13,894
Outside U. S.	12,202	21,616	13,622	3,425	....	....	17,047
TOTAL	**133,552**	**131,188**	**95,608**	**45,799**	**11,825**	**2,150**	**155,382**
WATERWHEEL GENERATORS (4,000 kw and larger) (Mw)							
U. S. El. Pr. Sys.[a]	1,700	2,227	1,703	2,468	1,357	557	6,085
U. S. Indl.[b]	....	....	....	....	....	....	....
Outside U. S.	87	154	216	416	....	....	632
TOTAL	**1,787**	**2,381**	**1,919**	**2,884**	**1,357**	**557**	**6,717**
HYDRAULIC TURBINES (5,000 hp and larger) (Thousand hp)							
U. S. El. Pr. Sys.[a]	1,224	3,092	3,744	2,689	880	445	7,758
U. S. Indl.[b]	....	....	....	17	34	....	51
Outside U. S.	11	293	229	....	....	....	229
TOTAL	**1,235**	**3,385**	**3,973**	**2,706**	**914**	**445**	**8,038**
POWER TRANSFORMERS (501 kva and larger) (Mva)							
U. S. El. Pr. Sys. & U. S. Indl.[d]	70,005	34,441	37,980	13,794	3,318	1,141	56,233
Outside U. S.	2,073	811	1,624	237	....	....	1,861
TOTAL	**72,078**	**35,252**	**39,604**	**14,031**	**3,318**	**1,141**	**58,094**

[a] U. S. Electric Power Systems. [b] U. S. Industrial. [c] Values for 1959 include shipments made during the first six months and orders scheduled for shipment during the balance of the year. [d] U. S. Electric Power Systems and U. S. Industrials.

NEW GENERATING EQUIPMENT

. . . On Order & Scheduled for Shipment (4,000 Kw and Larger)

(U. S. Elec. Power Systems Only)

The total capacity of 29,287,450 kw on order and scheduled for shipment as of July 1 is 3.7% less than at the beginning of the year and 20.8% less than on July 1, 1958. Lowest reported since 1955, approximately 28% of this backlog is scheduled for shipment during the last six months of 1959, 42% during 1960, 23% during 1961, and remaining 7% in 1962 or later.

Shipments scheduled July 1 for 1959 are 2.3% more than reported July 1, 1958, with little change in schedule since April 1. Part of the new capacity ordered since April 1 has been scheduled for shipment in 1960, part in 1962, but the bulk has been scheduled for 1961.

Of the total of 14,445,000 kw scheduled for delivery in 1959, as of July 1, approximately 42% was *shipped* during the first six months. (This compares with 52% of the 14,176,725 kw scheduled to be placed in operation for 1959, already in service.)

The capacity shipped during the first six months of 1959 exceeded the new capacity ordered during the same period in 1958 by over a million kw, or about 21%.

. . . In Operation

(All Power Systems, U. S. and Other)

New electrical generating capacity is being brought into commercial operation in close agreement with the schedule established at the beginning of the year. The 14,176,725 kw scheduled for 1959 exceeds

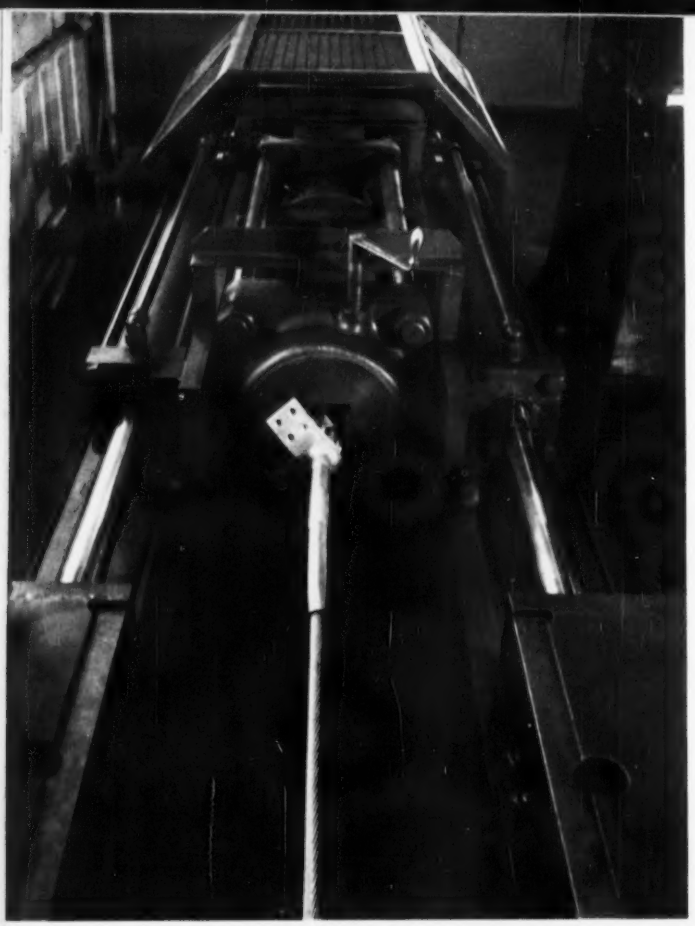
(*Continued on page* 77)

Alcoa maintains a crew for work on the experimental outdoor test spans at Massena, N. Y. In photo above, linemen prepare to compress new tubular dead end with 100-ton Alcoa compressor. Note use of A.F.C.-Alcoa Filler Compound.

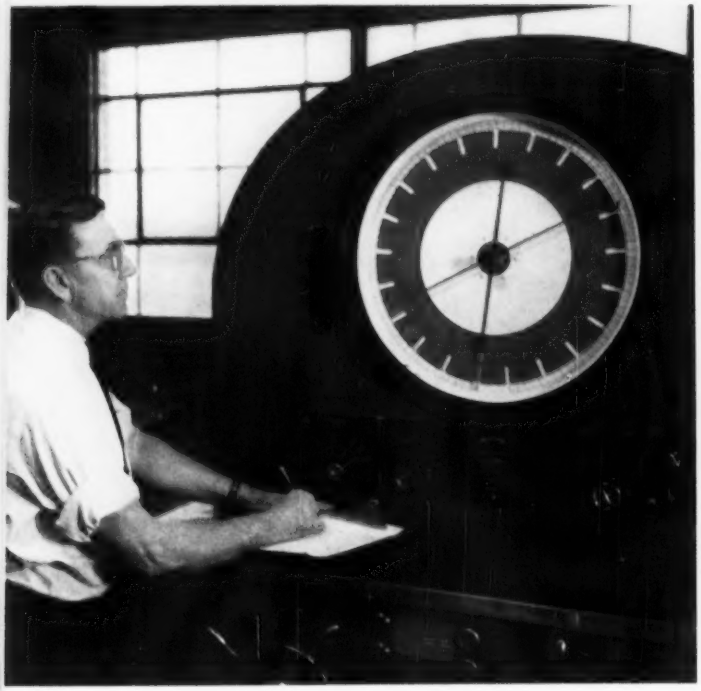
ALCOA RESEARCH

. . . development today for tomorrow's loads

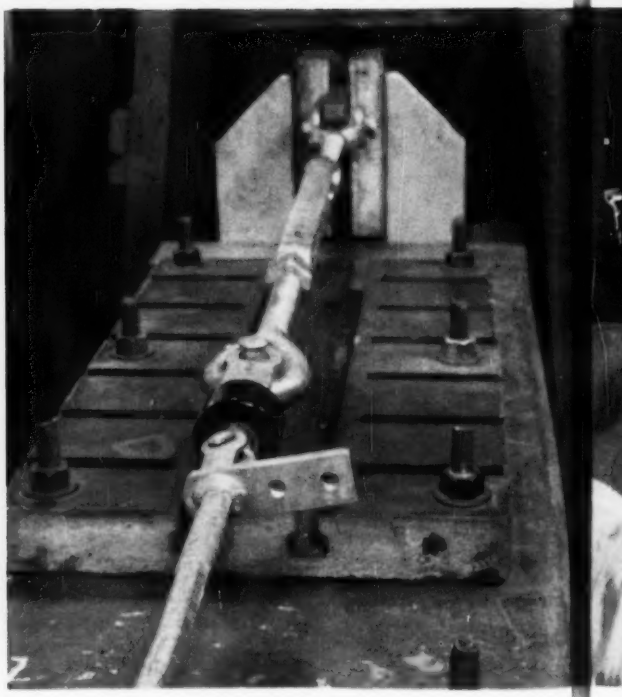
HOW ALCOA DEVELOPS NEW CONDUCTOR ACCESSORIES



NEW ALCOA TUBULAR ACCESSORIES PROVIDE ECONOMY WITH GREATER CONVENIENCE



Tension Tests assure that joints and dead ends in the new line successfully hold to tensions exceeding 95 per cent of the rated strength of the conductor. At tensions in excess of this accepted mechanical rating, failure will always occur in the conductor, never in the accessory.



Holding Tests over extended time periods prove that slippage of conductor in compression fittings does not occur even at higher than "in-service" tensions. Compressions do not loosen; there is no possibility of the conductor pulling out.

The facilities of Alcoa's Research Laboratories at Massena, N.Y., are devoted to all problems and developments related to aluminum conductors and their applications. Most recent of these developments is the announcement of a new line of tubular compression accessories for *all* standard transmission and distribution wire sizes.

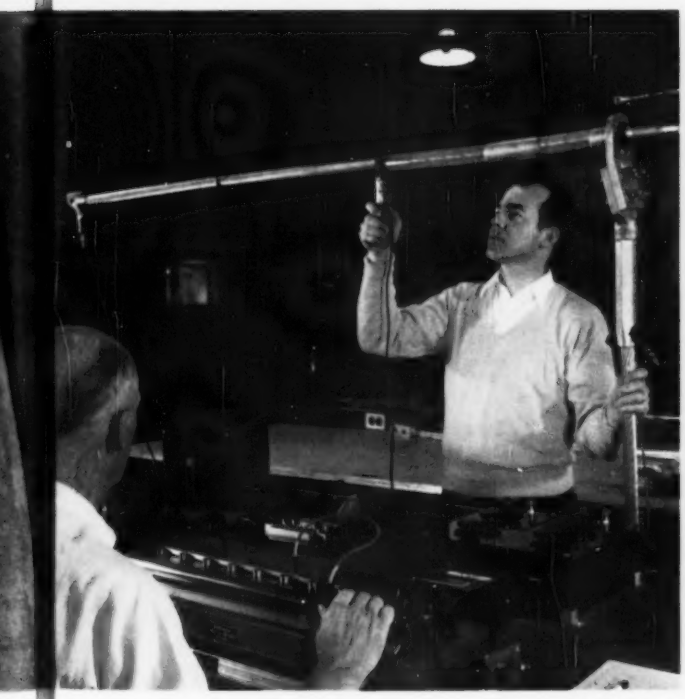
After several years of thorough testing in the laboratory and field, these conductor accessories offer you new conveniences and savings in the construction and operation of your lines.

Illustrated on these pages are several typical examples of the tests performed to prove that even the most severe electrical and mechanical requirements expected of Alcoa products are met and exceeded. The result is extended service life and trouble-free performance.

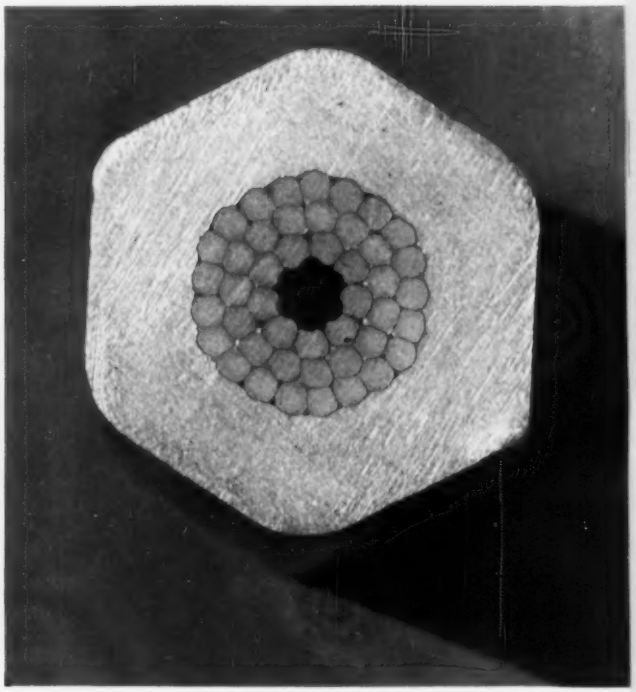
ALCOA ALUMINUM
ALUMINUM COMPANY OF AMERICA

ALCOA RESEARCH

. . . development today
for tomorrow's loads



Heat Cycling tests on compression accessories thoroughly determine maximum current-carrying capacity. Low initial resistance measurements across compression as well as bolted jumper connections remain low during and after current cycling.



Cross Sectioning of compressions determines how intimately compacted the conductor becomes with hexagonal compression die design. Superior electrical and mechanical joints are the result of fewer number of voids in the conductor.

NEW ALCOA TUBULAR ACCESSORIES ... EASY TO HANDLE ... EASY TO INSTALL

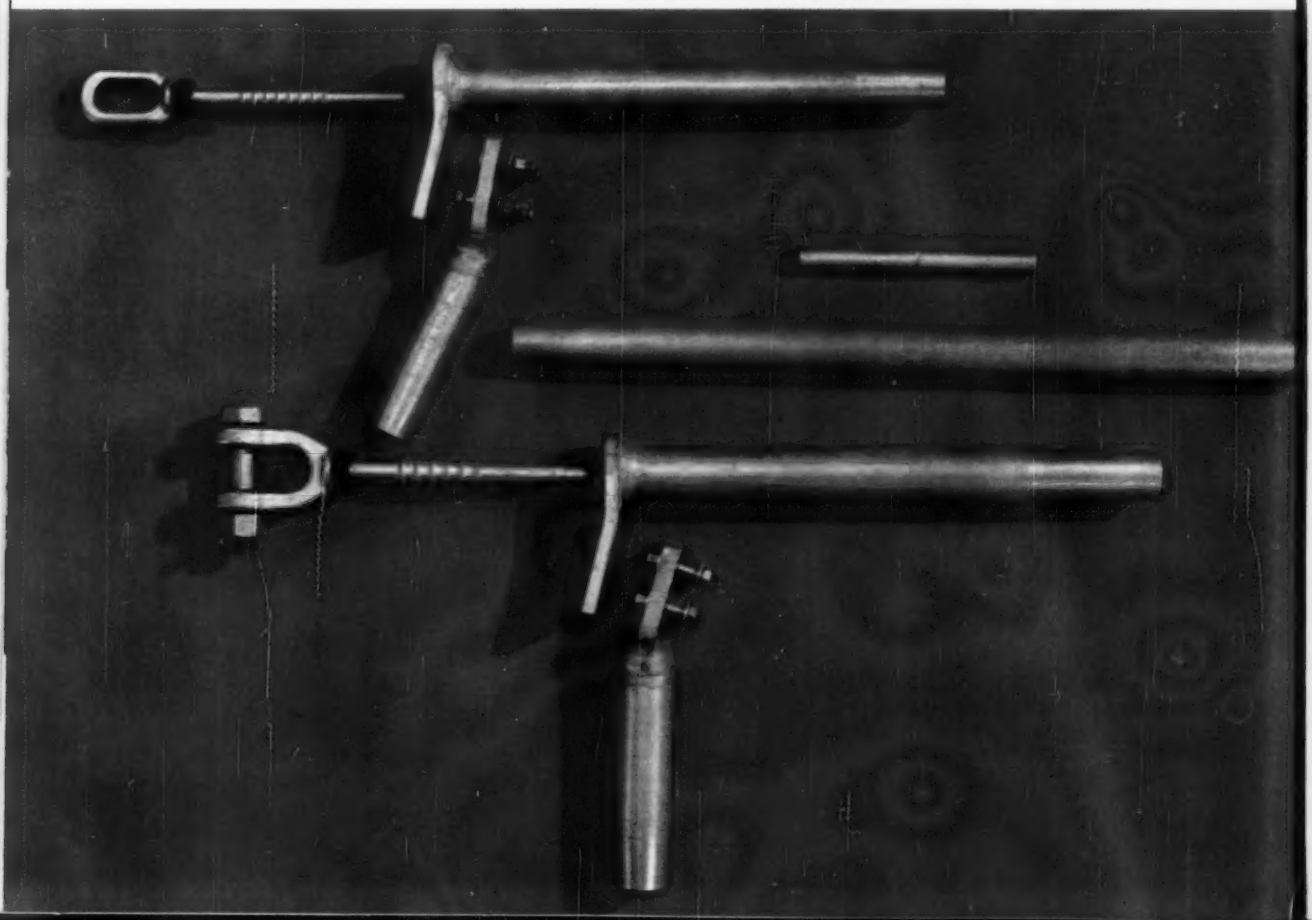
New Alcoa tubular accessories are easy to handle and install. Insertion of the cable is simple because of the smooth interior surfaces of the drawn tubular bore. Wire sizes from #4 through 1,590,000 cm can be worked in the air with a 60-ton press. Standard bolt hole spacing of dead-end tongues permits interchangeability so that all jumper terminals fit any dead-end body. For special installations, the tongue may be positioned radially about the axis of the conductor prior to compression. In addition, 15° angles on both dead-end tongues and jumper terminals allow the jumper loop to be placed in either perpendicular or 30° positions with the same accessories. The series of dead ends provides either eyes or clevises where construction practices make them most convenient. Catalog identification is clearly stamped on each accessory; dies required are stated; positions for compression are indicated.

These and other convenience features of the new, economical Alcoa tubular accessories facilitate neater, faster . . . and therefore less expensive . . . installations. Ask your Alcoa electrical sales engineer for complete information. Aluminum Company of America, 2110-G Alcoa Building, Pittsburgh 19, Pennsylvania.

ALCOA ALUMINUM
ALUMINUM COMPANY OF AMERICA

Your Guide to the Best in Aluminum Value

For exciting drama watch "Alcoa Presents" every Tuesday, ABC-TV, and the Emmy Award winning "Alcoa Theatre" alternate Mondays, NBC-TV



Electrical Equipment On Order Hits 4-Yr Low

(*Continued from page* 72)

slightly the 14,104,050 kw placed in service in 1958, although the number of units is less: 134 against 159 added during 1958.

Thermal units account for approximately 90% of scheduled capacity to be placed in service in 1959, compared with 83% in 1958. Fifty-three thermal units, or 6,729,150 kw, were put into operation during the first half of 1959, and 12 units of hydro power, or 639,600 kw. Second-quarter figures greatly surpassed the first-quarter figures: a total of 4,859,500 kw thermal and hydro generating capacity placed in operation by U. S. electric power systems, compared with 2,509,250 kw, respectively.

(*Continued on page* 80)

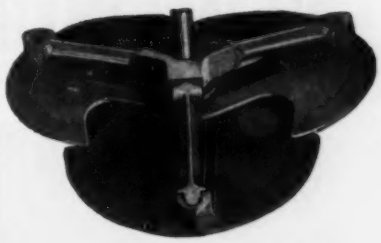
Transformer Gets 62 Mph Road Test

Speeds of up to 62 mph were attained by this trailer truck carrying a 2000-kva load center transformer, in road tests conducted by General Electric. The purpose of the tests was to recreate as nearly as possible the condition of a transformer when it is received by a customer.

Engineers from the Rome, Ga. plant crouched alongside the unit with specially designed vibration recorders and took notes while traveling at the high speeds.

A special police escort enabled the truck to go well over the speeds at which it would normally travel, imposing extreme conditions on the transformer. But after a three hour trip over rolling North Georgia terrain, the transformer was thoroughly examined and found to be ready for on line service, GE says.

EXTRA Holding Power
QUICKLY Installed
TOUGH For long life

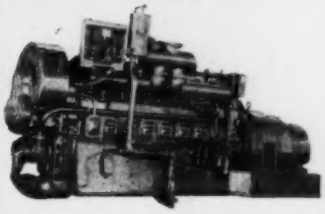


EVERSTICK ANCHORS

For new construction and maintenance — Everstick Anchors speed up work and provide dependable anchorage on all types of jobs. Made of resiliant, rust resistant malleable iron. The toughest anchors made. Write for bulletin.

EVERSTICK ANCHOR CO.
FAIRFIELD, IOWA

375kva diesel engine generator installed and operative in 48 hour crash program



ANP (Aircraft Nuclear Propulsion Division) Idaho Falls, Idaho, secured delivery for a priority program of a complete 375kva diesel engine generator set that was shipped 860 miles, installed and in operation 48 hours after ordering. The unit, in stock in the San Francisco area, was tested and shipped within 24 hours. The supplier, A. G. Schoonmaker Co., Inc., maintains a stock of 100kw to 1000kw diesel engine generator sets available for immediate delivery.

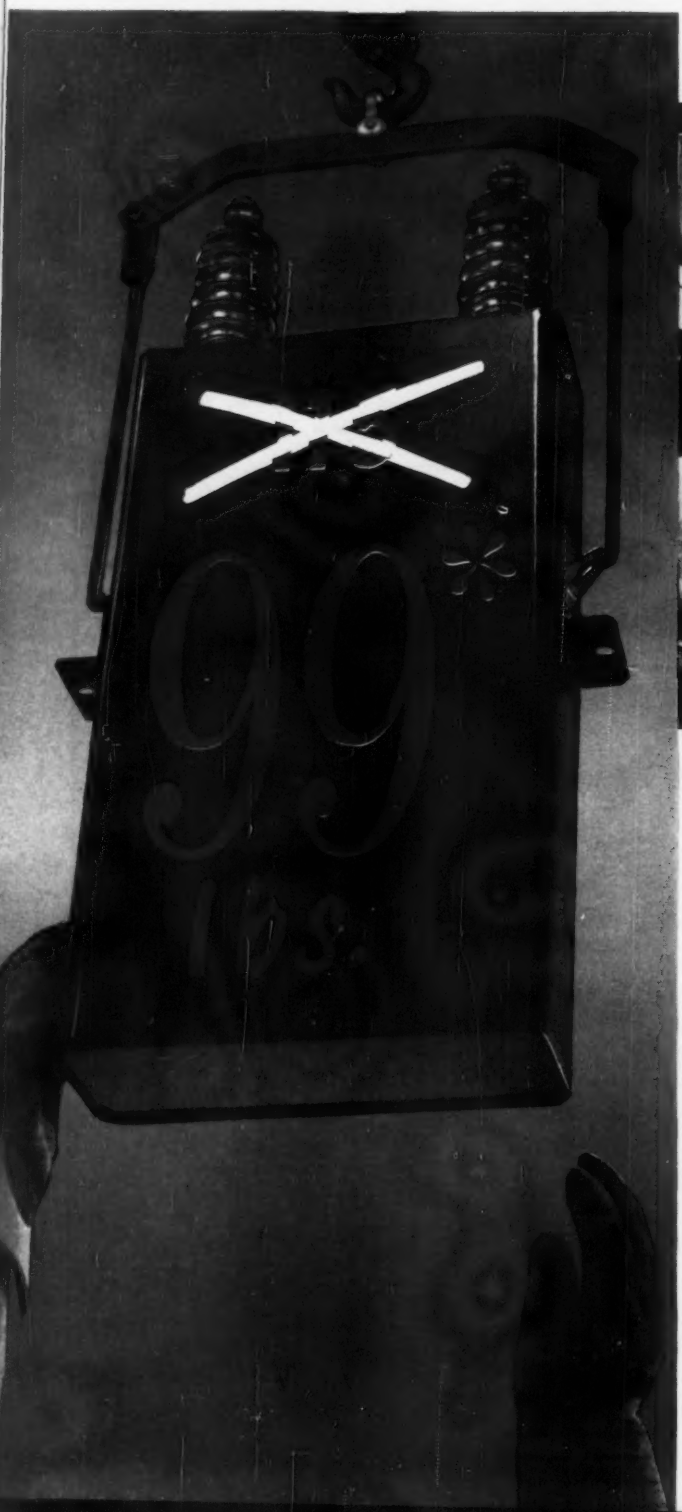
A. G. SCHOONMAKER Company, Inc.

Foot of Spring St., Sausalito, Calif.
EDgewater 2-1490

50 Church Street, New York 7, N. Y.
Digby 9-4350

GENERAL ELECTRIC ANNOUNCES

NEW "ISOKRAFT 50" CAPACITORS



Faster, easier, less expensive installation . . .

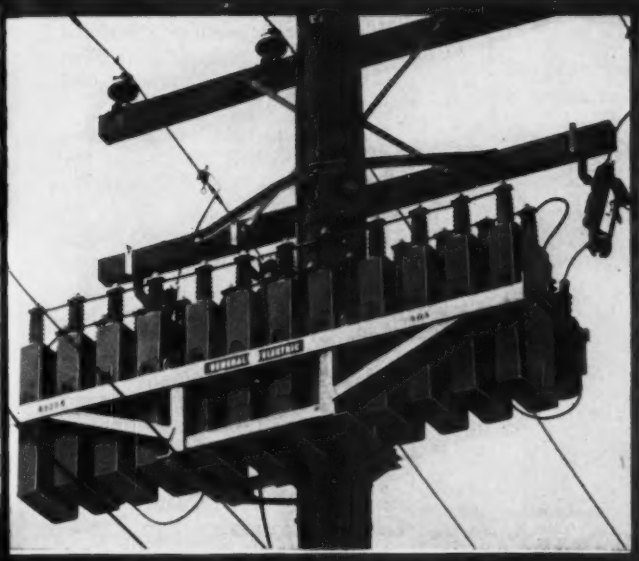
NEW "ISOKRAFT 50" CAPACITORS PERMIT

- More KVAR per pole
- Easier installation

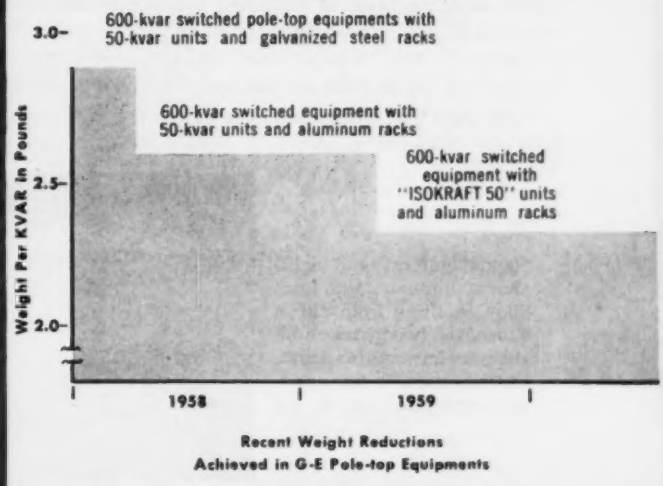
***14% lighter than previous General Electric units**

†Trade-mark of General Electric Co.

SMALLER AND 14% LIGHTER*



. . . 600-kvar equipment at 450-kvar weight are . . .


3.0–
2.5–
2.0–
Weight Per KVAR in Pounds
600-kvar switched pole-top equipments with 50-kvar units and galvanized steel racks
600-kvar switched equipment with 50-kvar units and aluminum racks
600-kvar switched equipment with "ISOKRAFT 50" units and aluminum racks
1958
1959
Recent Weight Reductions Achieved in G-E Pole-top Equipments

. . . benefits of General Electric capacitor progress.

General Electric's new "ISOKRAFT 50" capacitor weighs less than 2 pounds per kilovar, LIGHTEST 50-KVAR CAPACITOR ON THE MARKET TODAY. Lighter weight and smaller size make "ISOKRAFT 50" capacitors easier to handle and permit more kilovars per pole.

14% WEIGHT REDUCTION results from new ISOKRAFT† paper dielectric, combined with improved internal construction and manufacturing methods. New 600-kvar equipments with aluminum racks now weigh no more than older 450-kvar equipments with galvanized steel racks and heavier units. With "ISOKRAFT 50" stainless-steel case units, the new General Electric equipment permits faster, easier, less expensive installation.

GREATER RELIABILITY—Lower temperature rise and increased ability to withstand lightning and switching surges contribute to a more reliable capacitor unit.

Check to see how General Electric's new "ISOKRAFT 50" capacitors can benefit your system.

FOR COMPLETE INFORMATION, write for bulletin GEA-6990—Section 445-29, General Electric Co., Schenectady 5, N. Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC

ACCO *Aluminized* CORE WIRE

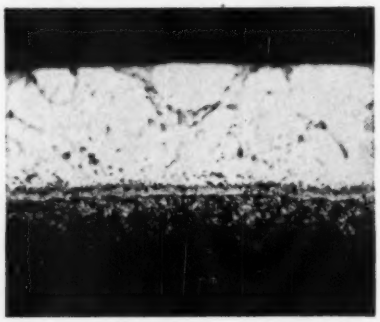
Outlasts Galvanized at least 2:1!

Page ACCO *Aluminized* core wire for ACSR provides all the strength of steel plus the corrosion-resistance of aluminum. An adherent, ductile coating of aluminum is applied by Page's patented hot dip method. Salt spray testing conducted according to ASTM procedures proves that ACCO *Aluminized* wire should last *at least twice as long as galvanized.*

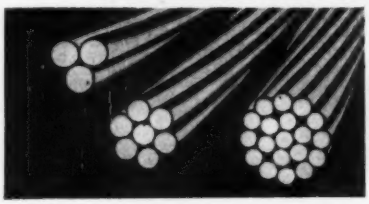
It is available from leading manufacturers of ACSR who have recognized the advantages of stranding aluminum conductor wires over an aluminized steel core—eliminating the "third metal" (zinc) in the completed conductor cable. Aluminized steel core wire assures longer life for your ACSR in both marine and industrial atmospheres.

Next time you order conductor cable, specify ACCO *Aluminized* core wire—it gives more reliability per dollar than any other core wire available.

500X magnification at right shows thin aluminum-iron alloy resulting from diffusion of the two metals, and the outer layer of aluminum in the form of a fine-grain cast structure.



OTHER ACCO *Aluminized* STEEL WIRES



ACCO *Aluminized* steel strand is available with 3, 7 and 19-wire construction for guy, ground and messenger wire applications. Offered in Common, Siemens-Martin, High Strength, Extra High Strength, Utility grades.

Page chain link fence of ACCO *Aluminized* wire provides attractive, economical and longer-lasting protection.

Tie wire, telephone and telegraph wire, barbed wire and other products also are available in Page ACCO *Aluminized* wire. Ask us for details.

WRITE FOR DETAILS...

Booklet DH-537 explains the manufacture, properties and uses of Page ACCO *Aluminized* steel wire. Write us at Monessen, Pa., for your copy.

PAGE MANUFACTURERS WIRE

ACCO

Page Steel and Wire Division
American Chain & Cable Company, Inc.
Monessen, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Portland, Ore. San Francisco, Bridgeport, Conn.

PAGE *—the source for answers to wire problems*

Electrical Equipment Survey

(*Continued from page* 77)

Changes in schedule from 1/1/59 to 7/1/59 for major equipment to be shipped for U. S. electric power systems shipped from 1/1/59 and scheduled from 7/1/59 through '62 and later.

Steam turbine-generators: scheduled as of 1/1, 156 units, 22,335 Mw; scheduled as of 7/1, 183 units, 25,852 Mw.

Steam generators: scheduled as of 1/1, 96 units, 102,721,000 lb/hr; scheduled as of 7/1, 117 units, 124,-444,000 lb/hr.

Waterwheel generators: scheduled as of 1/1, 71 units, 5,290 Mw; scheduled as of 7/1, 87 units, 6,085 Mw.

Hydraulic turbines: scheduled as of 1/1, 71 units, 6,949,910 hp; scheduled as of 7/1, 89 units, 7,-758,360 hp.

Power transformers: scheduled as of 1/1, 1,608 units, 39,121 Mva; scheduled as of 7/1, 3,943 units, 56,233 Mva. Includes U. S. Ind.

MANUFACTURERS BRIEFS

American Crossarm & Conduit has been re-bought by its original owners 2½ years after it had been purchased by A. B. Chance to operate as a division.

In making the announcement, Frederick A. Masterson, president of American Crossarm & Conduit, said that he and his associates had purchased all the capital stock of the division, effective July 31, 1959. Mr. Masterson said he was forming the new corporation "to continue the business under the name that has been closely associated with Graybar Electric and throughout the industry for over fifty years."

General Electric develops switch and bus insulator with twice the cantilever strength of present cap and pin insulators. For use in Project EHV, new unit is first to meet EEI-NEMA rated arcing distance for all standard BIL's.

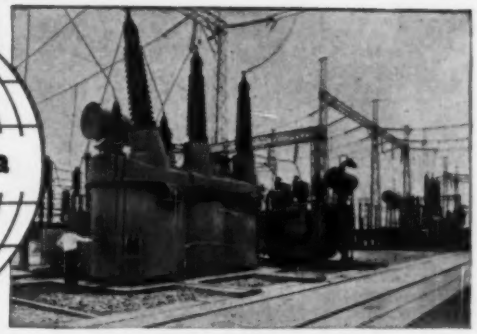
Westinghouse announces new relays for multi-unit metering power distribution systems. Semiconductor devices combine demand impulses from as many as seven sources and retransmit them over single output circuit.

(*More Products & Procurement, p* 82)

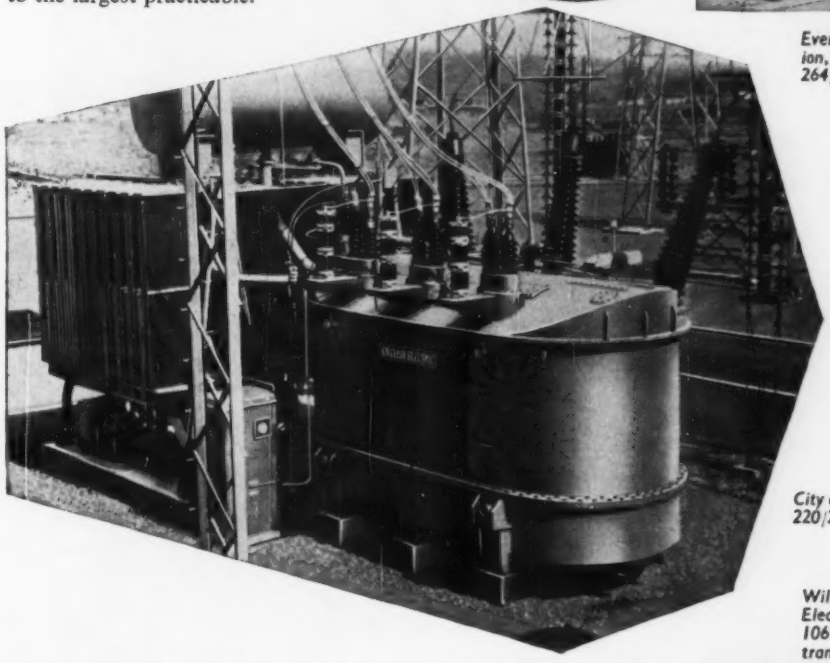
Power Transformers

'ENGLISH ELECTRIC' transformers, *in* service under varied climatic conditions throughout the world, are built to individual requirements. They can be supplied for voltages up to the highest envisaged and for outputs up to the largest practicable.

in South Africa



Everest Substation, Electricity Supply Commission, South Africa—two of four 150 MVA, 264/132 kV, 3-phase, 50 cycle, auto transformers



in the U.S.A.

City of Seattle, Washington—two 125 MVA, 220/26 kV 3-phase, 60 cycle transformers

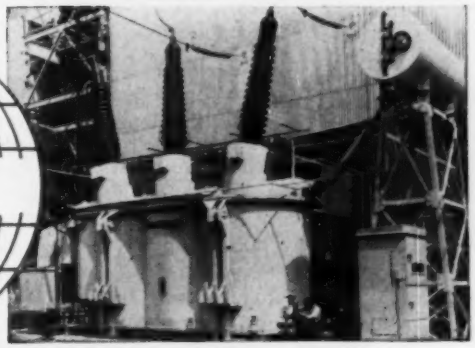
Willington 'A' Power Station, of the Central Electricity Generating Board, one of two 106 MVA, 295 kV, 3-phase, 50 cycle generator transformers

Two of the largest transformers rated at 345 MVA, 22·5/161 kV, 3-phase, 60 cycles, are in service at the T.V.A. Gallatin Power Station, Tennessee.

Contracts have been completed and others are in hand for many other major American power projects.

'ENGLISH ELECTRIC' products cover all aspects of the generation, transmission and utilisation of electric power.

in England



'ENGLISH ELECTRIC'

Agents: ENGLISH ELECTRIC EXPORT & TRADING CO. LTD., 750 THIRD AVENUE, NEW YORK 17, N.Y. Tel: MURRAY HILL 7-0303

Sub Agents:—

James I. Metcalf & Co. Inc., 701 United Pacific Building, Seattle 4, Washington. Branch offices in San Francisco, Los Angeles, Portland, Phoenix, for Alaska, Arizona, California, Idaho, Montana, Nebraska, Nevada, Oregon, Utah, Washington and Wyoming.

Osgood and Associates Inc., 988 Spring St., N.W., P.O. Box 7383, Station C, Atlanta 9, Ga., for Alabama, Florida, Georgia, Kentucky, South Carolina and Tennessee.

Electron Equipment Co. Inc., 1050 Constance St., New Orleans, 13, La., for Louisiana and Mississippi.

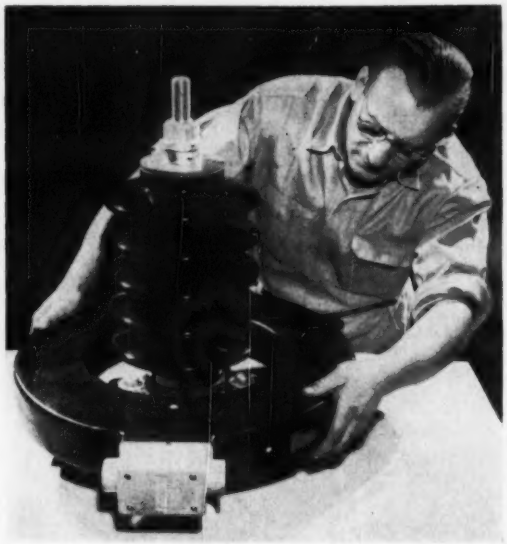
Peabody Bros., 2903 St. Louis St. at Oakland, Dallas, 26 Texas. Branch offices in Houston and Tulsa, for Arkansas, New Mexico, Oklahoma and Texas.

SERVICE FACILITIES ARE AVAILABLE THROUGH THREE LARGE CANADIAN PLANTS

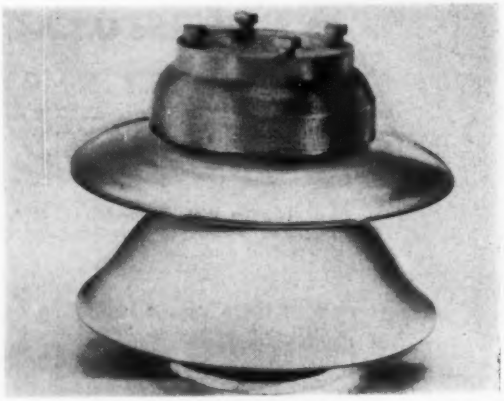
OC/US/6

(For further information refer to Reader Service on page 84)

Bushing Transformer . . .



. . . is designed for circuit relaying, indicating or protection. Known as the "Versaformer," it is installed on existing units by merely slipping it down over the power bushing, eliminating untanking. The device is cast in epoxy resin, making it weatherproof and resistant to salt or acid atmospheres. Furnished with a 4-in. adjustable mounting bracket, it can be used with any standard ASA bushing, 34.5 kv or below. The transformer has a minimum current rating of 400/5 amp with a relay accuracy of 10L200.
Allis-Chalmers Mfg Co, Milwaukee 1, Wis.



Switch Insulator . . .

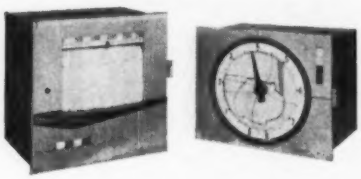
. . . of extra high strength design meets EEI-NEMA rated arcing distance for all standard BIL's. It is designated Locke Catalog No. 31444. Regardless of system voltages, only one extra high strength unit need be stocked. Single replacement represents only one-fifth to one-eighth total cost on 5 to 8 high stacks. The new unit, which has been selected for use in the 650-kv stations of Project EHV, is available in brown or gray.
Insulator Dept, General Electric Co, Baltimore 3, Md.

Drive Hooks . . .

. . . and drive lag screws are designed with a sharp, narrow pilot point for easy starting and driving. The drive hooks have a drive head projecting from the curved hook, and the drive lag screws have standard square heads. Rolled fetter drive threads provide maximum holding power.
Line Material Industries, McGraw-Edison Co, Milwaukee 1, Wis.

Recorder . . .

. . . "reads" a pencil-drawn program chart, controls a process accordingly, and superimposes a record of process performance on the same chart. The paralleled pencil lines defining the program are connected to two ends of a centertapped transformer winding which serves as a voltage source for an electrostatic field between the lines. The recording pen, serving also as a capacitive probe, picks up an error signal proportional to any deviation of the pen from its null position midway between the program lines. The device is known as the PREKORDER.
Research, Inc, 115 N Buchanan St, Hopkins, Minn.



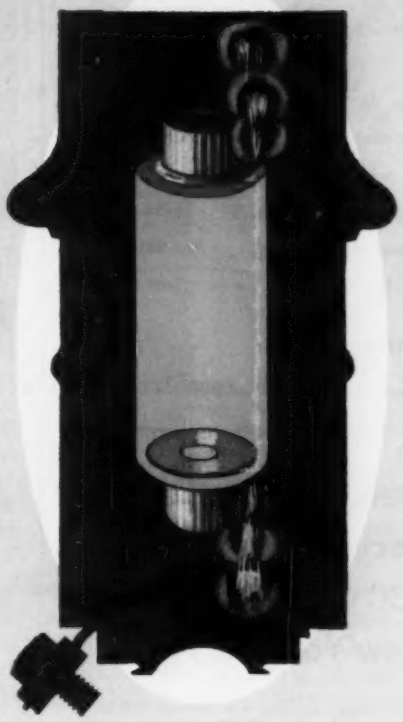
Truck Body . . .

. . . for 1-ton trucks is designed for use on jobs which are too heavy to handle by hand and too light to handle economically with 1½ and 2-ton trucks. A rolling tail pipe of 4½-in. O.D. schedule 80 seamless pipe is mounted on shielded ball bearings. Gin poles are of 2⅞-in.
(*Continued on page* 84)

AUTOGAP ARRESTERS *with the exclusive*

"Magic Cylinder"

... offer the unique combination of **LONG SERVICE LIFE** *and* **SUPERIOR PROTECTION** *with* **UNCHANGING CHARACTERISTICS**



Here is an outstanding combination of performance features that have been thoroughly proven in the field.

SUPERIOR PROTECTION in the Hubbard AUTOGAP arrester means *proper sparkover with negligible discharge voltage*—negligible with even the highest of lightning discharges.

LONG LIFE *without measurable electrical wear* is a matter of record with users who have "kept score" on the AUTOGAP.

Your Hubbard representative will be glad to supply you with full information. Call him today.

Also Makers of the EHD Faultmaster Cutout

BETTER PRODUCTS *through Creative Engineering*

HUBBARD

AND COMPANY • 200 SOUTH MICHIGAN AVENUE • CHICAGO 4, ILLINOIS

Manufactured in Canada by the N. Slater Company Hamilton, Ontario

LIVE BETTER ELECTRICALLY

Readers Service

For additional information on new products, supplies, and services in this issue, the Manufacturers Editor of Electrical World offers his facilities. Check items in which you are interested in list below:

NEW EQUIPMENT

Allis-Chalmers .....Transformer ☐
GE .....Insulator ☐
Line Material.....Hooks ☐
Research, Inc.....Recorder ☐
Leland .....Truck Body ☐
Burndy .....Terminals ☐
Westinghouse .....Relays ☐
Peschel .....Test Set ☐

OTHER

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Manufacturers Editor
Electrical World
330 W. 42nd St.
New York 36, N.Y.

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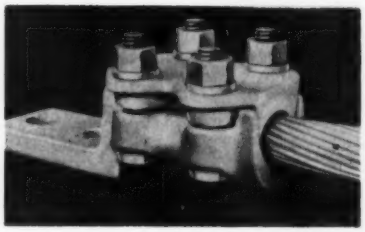
FOR:
Reference ..... ☐
Specs ..... ☐
Trial ..... ☐
Purchase ..... ☐

SEPTEMBER 7, 1959

Truck Body . . .

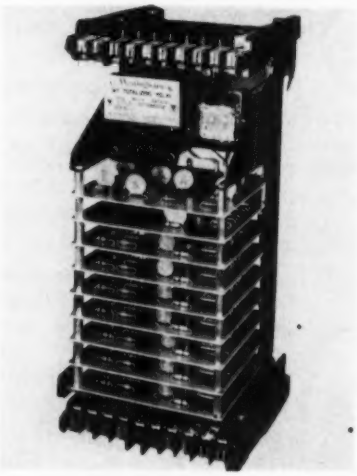
(*Continued from page* 82)

O.D. heavy wall seamless pipe, and the headache rack is made of 1½ and 2-in. pipe. An "A" frame is provided for the gin poles.
Leland Equipment Co, 408 N Main St, Tulsa, Okla.



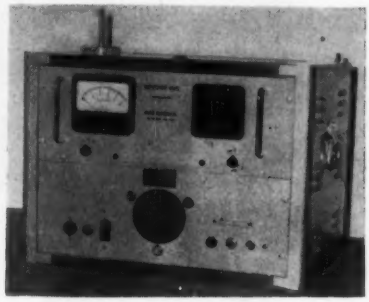
Terminals . . .

. . . for cable-to-flat connections to aluminum or copper in a wide range of sizes are now available. Only eight terminal sizes of the NAR-A connectors cover every cable size from No. 8 through 2,000-MCM copper and aluminum or 1,780-MCM ACSR. A single connector size will take as many as 35 different cable sizes.
Burndy Corp, Norwalk, Conn.



Totalizing Relays . . .

. . . for multiunit metering of power distribution systems use semiconductor devices to combine demand impulses from as many as seven sources and to retransmit them over a single output circuit. Except for one output relay, all circuit elements are static devices. The equipment is compatible with all existing systems without changes in input pulsing equipment or final impulse receiver. Known as "WT" relays, they are available with capacities of 3, 5 or 7 input channels.
Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.



Corona Test Set . . .

. . . features non-destructive evaluation of insulation quality. The Model CT10-0.2 has continuously adjustable output voltage 0 to 10 kv rms at 0.25 kva and zero start provision on powerstat output control. It is suitable for tests on transformers, bushings, terminals and short lengths of cable.
Peschel Electronics, Inc, Patterson, N. Y.

More New Products

Ultrasonic cleaner for cleaning small parts supplies high energy density. Known as Model 200, it has 1-gal stainless steel tank.—National Ultrasonic Corp, 111 Montgomery Ave, Irvington, N. J.

Telescoping **work platform** cuts relamping time. It can be assembled by one man and reaches heights up to 31 ft.—Up-Right Scaffolds, 1013 Pardee St, Berkeley, Cal.

Portable **balancer** detects vibration caused by worn bearings, belts and misalignment. Model 2390 features a strobe light.—Stewart-Warner Corp, 1826 Diversey Pkwy, Chicago 14, Ill.

Report on
Area Development

A preoccupation with attracting new plants indicates need for . . .

Developing Industry From Within

"It seems to be a lot easier to go get new industry than to find out what existing industries need and want." This attitude on the part of some electric utility area development men indicates that the surface has barely been scratched in the art of developing industry from within, according to one area development manager. The situation is compounded by the hesitancy of industrial plant owners and managers to reveal problems which can and do cause plant relocation, the area development man believes.

His critique is reinforced by comments from utilities contacted by Electrical World field editors and McGraw-Hill news bureau chiefs who found few concrete instances of planned area development programs for developing industry already on the line. Utilities are covering the broad front of power sales admirably, the interviews show. But it appears there is much to be done when it comes to such industrial plant problems as raw materials, transportation, diversification, supply of component parts or products, and lagging local sales.

The benefits of this kind of assistance are obvious. "We'd rather keep an existing plant from moving than get a new plant in of the same size," says an area development director, to avoid dislocating employees and the local economy, not to mention the costs of a new service connection.

A promising tool to keep industry flourishing at home is a market analysis sponsored by Niagara Mohawk Power Corp. The research centers on the St. Lawrence Valley's economic area, a region 25 to 30 miles wide running about 75 miles from the Adirondacks on the south to the towns of Massena and Malone at the northernmost section of New York State. Population

of the area is 180,000. Watertown on the southern end is the largest community with 36,000 people; Massena is second with 13,000.

The analysis differs from most other studies of this type in that it steers clear of predicting what the valley's future potential might be. Instead, the aim is to determine what types of new industry will be most practical for the area, which now includes aluminum reduction plants and paper mills as the major industries. The findings are expected to pinpoint opportunities that are open to potential "satellites" for these existing firms.

Once the satellite industrial prospects are identified, "we can make the most effective use of our very substantial national advertising budget devoted to promoting industry in New York State," says NM's Richard F. Torrey, director of area development. "The research is something like the manufacturer of consumer products would undertake before introducing a new item," he explains.

The market analysis "certainly holds a potential for benefits to existing industries," Torrey says. Probable benefits include improvement of these firms' supply needs and the creation of new industries, which will become customers of the companies already in the valley.

If successful, similar analyses will be made in other NM areas. The findings of the St. Lawrence Valley research, and any subsequent analyses, will be made available to interested communities served by the power company. In this regard, Torrey recently brought in one of his men to devote full time working with communities to encourage the formation of local industrial development groups. The first point that the reassigned man will make to them is the value of sponsoring a local analysis, such as the St. Lawrence undertaking, with the goal of bringing in component industries and prospective customers for the output of existing firms.

An economics professor at Syracuse University is conducting the research in the valley. He heads an independent research company which possesses a good portion of the data needed about the area. The market analysis started early in July and probably will be finished this month.

The potential of developing industry from within was explored at the 1958 Workshop of the Edison Electric Institute Area Development Committee. A dozen or so of the members agreed during a roundtable discussion that "about 85% of industrial development of an area came from the growth of existing industry and from new industry developed through the initiative, imagination, and work of local people." The topic of helping existing industry grow comes up for more detailed treatment at the committee's 1959 Workshop in Phoenix Oct. 20-22 when top utility executives and researchers will be featured speakers.

Some interesting approaches came to light at last year's session. For example, to help develop uses for available area resources some companies prepare catalogs listing industries by types along with their products, markets, raw material, or component sources. Other companies help poultry and dairy operators form commissions whose members, through a study of their problems and by improved cooperation, have increased output and erased some marketing difficulties. One utility company in the Southwest is now in the midst of a trial program to discover better agricultural packaging, marketing cycles, and by-product possibilities. The approach here is one of helping the farmer help himself.

This behind-the-scenes assistance to industry and agriculture is a method profitably used by Pacific Gas & Electric Co. A case in point is a "Product Potential Survey" put out by the San Francisco Chamber of Commerce. Pacific

G&E cooperated with the chamber in the survey, both as a committee member and by aiding in its distribution.

The objective of the study was to point out to manufacturers the potential for broadening their present lines or to show how they could get into new types of industry. To get the information, a questionnaire was mailed to more than 3,000 firms in the 13-county San Francisco Bay area, asking what products were used in volume, but purchased outside the state.

Along the same lines, a "Space Age Business Conference" highlighted the impact of the multi-billion dollar federal space program on local business. More than 180 men attended the full-day session, which PG&E helped sponsor. Another tool to industry planning is the utility's annual economic outlook. The report is widely circulated, and covers population trends, area development prospects, agricultural expectations, and utility sales possibilities. Its residential construction forecast is particularly helpful to the building industry.

A hard-hitting communications program (see box) is one highlight of Arizona Public Service Co's area development efforts. Because of the state's relatively recent "discovery" by industry, the emphasis has been split between attracting new plants and sparking city and town improvement projects. A definite factor in the success the company is enjoying is the consistent publicity its executives spread about the state's future and natural assets.

Teamwork between industrial sales and area development departments characterizes the efforts of PG&E and other utilities in developing local industry. Effective liaison between these departments is a must for discovering and helping to solve problems faced at an existing plant before the situation causes a shutdown, according to companies contacted by EW.

Sound community planning and development is another must in keeping industry content in present surroundings, as well as attracting new plants.

Arizona PS' Booklets Range From Town Development to Attracting New Plants

Title	Contents
"It's Your Move . . . To Help Develop Your Community"	Complete plan for setting up local committee, surveying communities' assets and needs, creating and financing industrial districts, and promoting the town. Includes analysis guide, "Pattern for Progress" sample, and exhibits on contractual and real estate agreements.
"Questionnaire for Planning Community Development"	Survey form to determine assets and liabilities of community. Covers everything from agriculture and airports to water supply and wholesale business.
"Phoenix Resources"	Brochure for industrial prospects. Describes the city and some of big new plants which have settled there.
Cooperative Brochures	Slick-cover folder of individual communities' services and facilities. Produced jointly by company and local chambers of commerce.
"Phoenix Transportation"	Copies of letters written by existing industry executives extolling cooperation and rates of transportation firms.
"Interested in Space?"	Slick-cover folder on growing room, Phoenix "hub" and transportation service map.
"Area Development Program"	Policy, objectives and background on Arizona Public Service area development department.

This is an activity in which many electric utilities shine, and the scope of their aid to service area towns and cities is indeed a broad one. The assistance ranges from top executives' roles in state-wide loan-making foundations to guidance for tiny hamlets in surveying local potential.

For example, to make sure land is available when an existing firm needs room in which to grow, or a new company decides to locate there, Cleveland Electric Illuminating Co has purchased 2,000 choice acres. CEI figures that one project alone—Mentor Industrial Park—will possess $1¼ billion of plant, property and equipment if only 20 to 25% of the park gets "an industrial roof over its head." Electric load growth potential is equally impressive.

System-wide evidence proves contests spark community betterment for his company, says E. N. "Red" Pope, Carolina Power & Light Co's advertising and sales promotion director. But one thing had to be learned the hard way: Don't label a contest as a "Community Betterment Program". Carolina P&L did this in the mid-Forties and found that one factor in the program's early death was the name it went by. It implied that communities served by the company were run down at the heels, Pope says. After this false start, Pope came up with the positive sounding "Finer Carolina Program" and, says an associate, has done the most to make it a success in the seven years since its start.

The contest pits communities against each other in making needed improvements, ones which the townspeople themselves decide are necessary. Carolina P&L, in addition to putting up money for the prizes ($6,750 for the 1958-59 program), provides a survey form, guidance and counseling, advertising support, and speakers for special occasions. No employee of the company, however, may hold an official position in the program unless he happens to head the local club or group which accepts an improvement project.

The ban on employees' participation was another lesson learned in the postwar effort. Before, when CP&L people served, the implication arose that the company "had assumed responsibility for providing a cure for the communities' ills," Pope says. Other lessons: The program needed adequate financing and it should not be the responsibility of one CP&L department.

Here's how the contest works: Communities compete in three population classifications. Depending on size, the communities take on from three to five improvement projects under overall direction of a community organization, with subcommittees assigned to each project. Judges who live outside CP&L's area pick winners on the basis of scrapbooks describing the improvements and visits to the towns.

"Finer Carolina" expenditures have been a wise investment, CP&L's management believes. "Incremental cost to the company has been an average of $40,000 per year," says Pope. The company spends upwards of $100,000 annually to support the program, "but approximately 60% of the amount would have been spent for advertising supporting other promotions," he adds.

The return has been high on the investment. "Not only has the program been the best public relations tool ever employed by the company," Pope declares, "but increased revenues traceable directly to the program made the activity self-supporting after its third year." Other benefits include a facelifting of competing communities' business sections; creation of markets for food products grown in the area; establishment of parks and playgrounds; and success in attracting new industry. Up to 20,000 individuals—members of civic groups accepting responsibility for projects—have taken part. Virtually all of them agree with Red Pope's observation: "The Carolinas are finer as a result of the 'Finer Carolina Program.'"

NOMINAL WEIGHTS OF FINISHED WEATHER-RESISTANT WIRE AND CABLE

Pounds per 1000 Feet

Conductor Size AWG or Mcm	Copper & Copper Alloy Conductors: URC Type Double Braid	URC Type Triple Braid	Neoprene Type	Polyethylene Type	Aluminum Conductors: Neoprene Type	Polyethylene Type
Stranded						
2	246	270	248	**230**	105	**87.4**
4	155	170	163	**143**	73.3	**53.3**
6	103	115	108	**91.5**	51.5	**35.0**
Solid						
2	239	260	232	**219**	92.2	**79.2**
4	151	164	152	**136**	64.0	**48.0**
6	100	112	101	**87**	45.7	**31.7**

Sources: American Standards Association Specifications

This table shows

POLYETHYLENE covered line wire weighs less

Because it's the lightest, polyethylene-covered line wire is the easiest for linemen to string up . . . hardest for ice and snow loading, gale-force winds to bring down.

Polyethylene-covered line wire, depending on size and conductor, weighs from 5% to 32% less than other types. That's what the figures in the specifications tabulated above show.

This, of course, is no news to linemen who have strung all types of weatherproof line wire. They may not be able to quote pounds and percentages, but they all know you can't beat polyethylene on weight.

Linemen's Favorite Material

Light weight means easy handling, one of the main reasons polyethylene rates tops with installation crews. They also like polyethylene wire because it's clean . . . free-stripping . . . has a smooth, self-lubricating surface that almost makes pulling a pleasure. And despite the exterior slip, the plastic covering hugs the conductor tightly, doesn't ruffle as it goes over crossarms.

"Built-in" Safety Factor

Polyethylene's lightness provides lasting mechanical advantages, since span loads don't tax supports as much as heavier type wire. This "built-in" weight safety factor pays off when violent storms push aerial construction to strain limits . . . when ice and snow loads topple heavier lines.

An added factor in polyethylene wire's ability to stay up under adverse conditions is its smaller diameter. It offers less resistance to wind, a smaller surface for ice build-up.

Winning Combination

Called the "closest to the ideal covering for line wire," polyethylene is outstanding in other respects too. The shield it forms over wire is continuous . . . tough . . . resistant to aging, weathering, moisture, abrasion by lashing branches. It's good for decades of superior service marked by fewer outages, minimum maintenance.

When you order covered wire and cable, make sure the coating is made with PETROTHENE® polyethylene resins. PETROTHENE polyethylene costs no more, but it gives you premium weather and stress-crack resistance.

Polyethylene's advantages are outlined in an informative new U.S.I. data sheet, "Polyethylene . . . The Best Line Wire Covering." Also available is a data sheet showing properties, applications and specifications of PETROTHENE polyethylene compounds. Send for your copies today.

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Division of National Distillers and Chemical Corp.
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☐ "PETROTHENE Resins for the Wire and Cable Industry"

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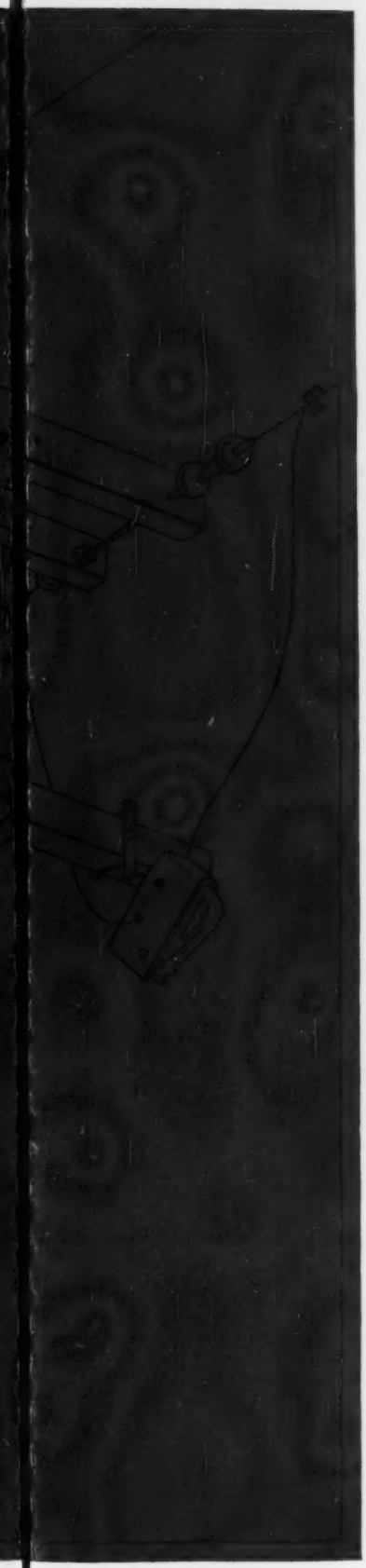
Branches in principal cities



Now, from Westinghouse . . .

ONE CUTOUT FOR ALL SYSTEM REQUIREMENTS

Here is a truly universal fuse cutout! The Westinghouse EU cutout spans a complete range of ratings to meet any system requirement. You need stock only one type of unit, saving you 10 percent or better per year on cutout inventory costs alone.

Only the Westinghouse universal cutout gives you . . .

- A single unit designed for application on single-phase systems up to 7.8 kv and three-phase multi-grounded wye systems up to 13.8 kv.
- A single 100-amp rating with growth capacity for tomorrow's distribution systems.
- The highest interrupting capacity available—14,000 amps at 2.8 kv, 10,000 amps at 5.2 kv, 6000 amps at 7.8 kv—all in one enclosed cutout.

Let us prove how Westinghouse EU cutouts can save you real inventory dollars while meeting every requirement on your system. Call your Westinghouse representative, or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania. J-60986

YOU CAN BE SURE...IF IT'S

Westinghouse

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS"
CBS TV FRIDAYS

Dial Calculator Answers Heat Pump Questions

FRANK S. WALTERS, Rate Engineer, Potomac Electric Power Co, Washington D.C.

Manufacturers, distributors, retailers and representatives of the utility industry are always receiving inquiries from people interested in heat pump equipment who ask such fundamental questions as, "How much does it cost to operate?" and "How does the cost of electricity compare with the cost of gas or oil in doing the same job?"

Unfortunately, there are no simple answers, since many engineering factors must be considered before a truly fair comparison can be made. However, a dial calculator which I have developed is an aid in furnishing replies to such queries.

Use of the device is confined to the heating portion of the year. It was designed in this way for simplicity and because people generally seem more familiar with the cost of heating than with cooling. Accordingly, they may want to compare costs for a heat pump with other heating costs which they have experienced in their homes.

The dial calculator provides answers to two of these questions.

1. It will compute the "break-even" price at which bills for a heating season would be the same for each fuel.

2. It will determine the percentage by which the bill for one fuel is higher or lower than for another.

In estimating operating costs for any type of equipment, it is necessary to know the efficiency of the system. Naturally, reasonable differences of opinion are found among heating experts and, because of this, no attempt was made in designing the calculator to establish a fixed efficiency for any particular type of fuel. Instead, a range of efficiencies is provided so that the user may select the value which he feels is realistic.

The calculator consists of a card on which two rotating disks are mounted. The prices of the different fuels are printed on the card; the efficiencies of the different systems are on the outer disk, and the percentages which show the relative cost of one fuel over another are indicated on the inner disk, (the percentages go from —45 to +70%).

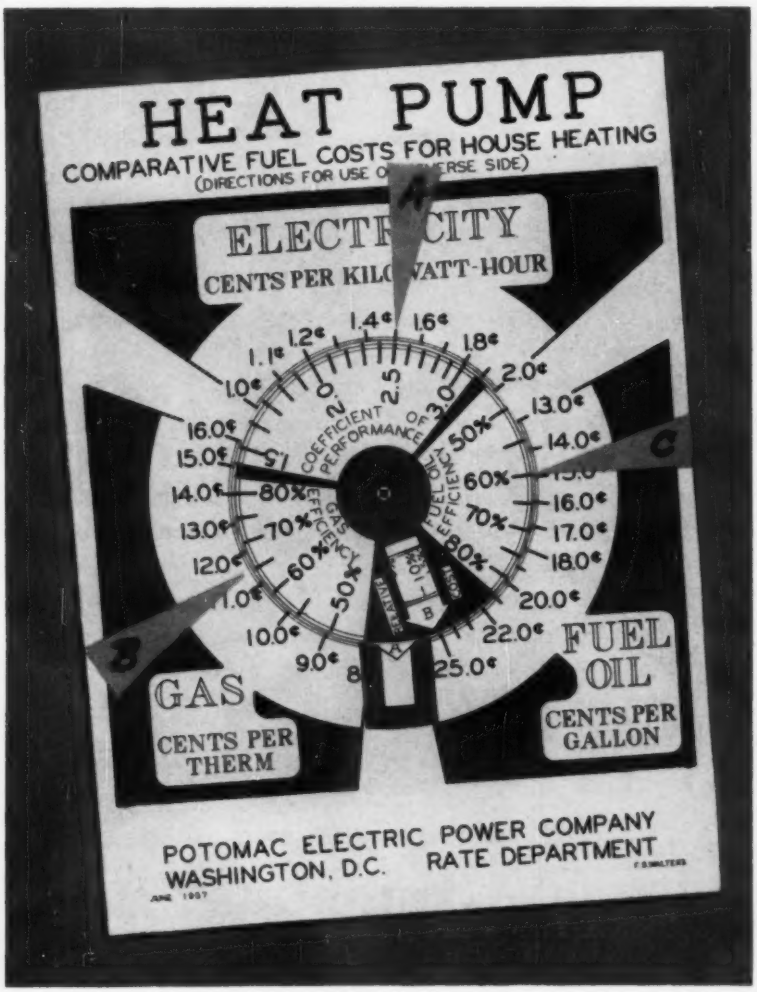
Operation is quite simple:

Starting with the prevailing cost of electricity, the outer dial is set so that the coefficient of performance for the heat pump is opposite this price per kwhr. Without any other manipulation of the calculator, the "break-even" price of both gas and oil may be read directly opposite the efficiency assumed for each system.

After the "break-even" price has been found, the tab which extends from the inner dial is turned until the arrow "A" marks this price. (Note: This is the small capital "A" on the wheel itself.) Then by turning the outer dial until the arrow "B" is opposite the actual price of the fuel in question, cost of this fuel relative to the cost of electricity is indicated directly in percent.

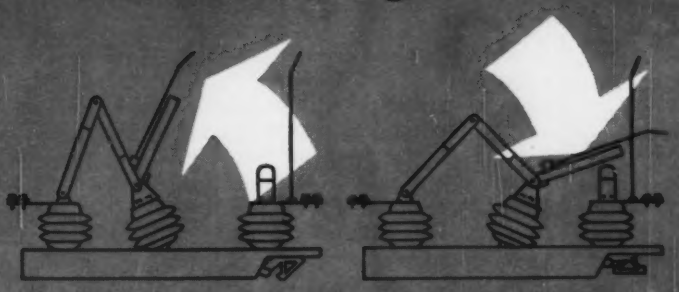
For example, if the cost of electricity is 1.5¢ per kwhr (see large

(*Continued on page* 94)



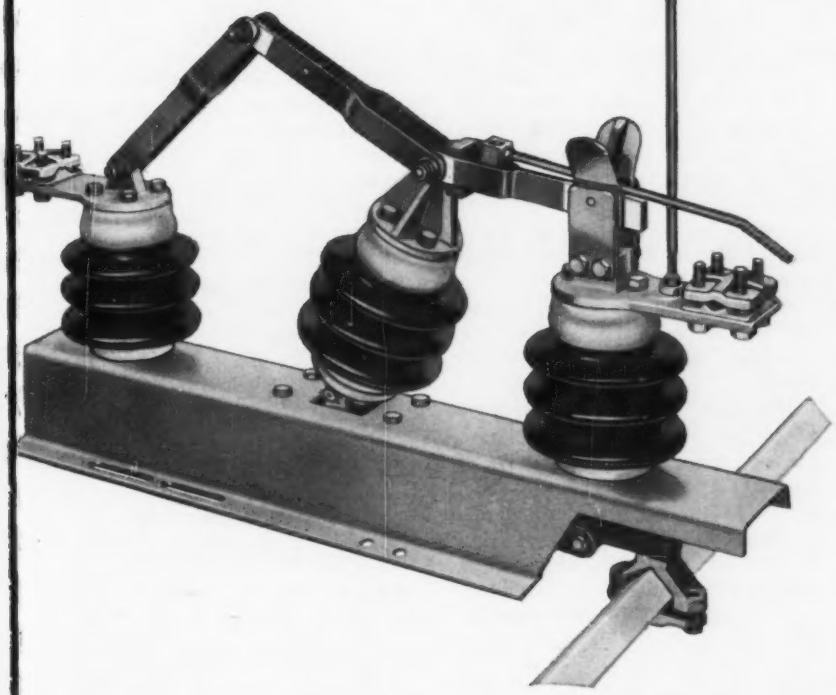
Special **KEARNEY** design for

smooth opening and closing



despite crossarm warpage

TILTING INSULATOR GANG SWITCH



- Switch works smoothly even when crossarms are warped out of alignment, horizontally or vertically, because the specially designed interphase shaft clamp compensates for any structural distortion
- Double leverage frees switch blade of heavy ice coatings: "pry-out" blade action plus toggle action of operating linkage on the tilting insulator
- Longer maintenance-free service in corrosive atmospheres—and in unusually frequent operation—because there is no flexible blade shunt to wear out
- Extra long jaws: adjustment for blade travel need not be critical . . . silver blade to jaw contacts
- Tilting insulator supported by Oilite bearings
- Easy installation . . . interphase shaft can be lifted into clamps after switch is in position

JAMES R. KEARNEY CORPORATION
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-365

for BETTER CONSTRUCTION
SAFER MAINTENANCE
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GALVANIZED STEEL STRAND FOR GUY, MESSENGER and OVERHEAD GROUND WIRE

The high, uniform, consistently-dependable quality of Crapo Galvanized Steel Strand is the direct result of close laboratory control over each step in manufacture. All wires used in forming a particular size and grade are produced from steel of selected analysis, carefully processed under technical supervision and stranded on precision machines. Both wire and finished strand are subjected to prescribed laboratory tests to insure the desired end result.

Heavy, uniform, tightly-bonded zinc coatings, applied by the famous Crapo Galvanizing Process, provide maximum resistance to corrosion.

Write for booklet OG-25 containing "Sag and Tension Data for Overhead Ground Wire."

INDIANA

STEEL & WIRE CO., INC., Muncie, Indiana

Dial Calculator . . . (*Continued from page* 92)

"A"—grey arrow) and the heat pump coefficient of performance is assumed to be 2.5 to 1, then the "break-even" price of gas, assuming 65% efficiency (arrow "B") may be read directly as 11.4¢ per therm, and that of oil, assuming 60% efficiency (arrow "C") is indicated at 14.8¢ per gallon.

The grey arrows are for illustrative purposes only and do not come with the calculator.

The use of the calculator to determine the relative cost can be illustrated thusly

The "break-even" price of gas, of 11.4¢ per therm, is marked by turning the tab on the inner dial until the small arrow "A" points to this price. If the actual price of gas is 13¢ per therm, the relative cost of gas to electricity is found by one additional setting. The inner dial, marking the "break-even" price, is held in place by placing the thumb on the tab. The outer dial is then turned until small arrow "B" points to the actual prevailing price of 13¢. Under these conditions, the cost of gas for the heating season would be approximately 14% greater than the cost of electricity. This percentage would be read directly through the opening in the outer dial.

If the prevailing price of gas was 10¢ per therm instead of 13¢, the operation would be done in this manner:

The inner dial is again held by means of the tab in its position marking the "break-even" cost of gas at 11.4¢ per therm. In this case, however, the outer dial is turned until arrow "B" indicates a prevailing price of 10¢ per therm. Under these conditions, the bill for gas would be approximately 12% lower than the bill for electricity for the season. This is indicated directly in the window in the outer dial.

The calculator is based solely on the heat content of the fuels in question and, therefore, assumes that all other factors are equal.

From the standpoint of practical application, differences may be planned in the materials used in house construction, the type of insulation, or other such basic factors. Appropriate allowances must be made for the effects of these differences and such points can be brought to the customer's attention during the general discussion after his initial question has been answered.

In estimating the relative costs of electricity and either of the combustion-type fuels, consideration must be given to the fact that electricity used for driving fans, pumps, blowers, and control equipment, which are normally associated with gas and oil systems, is not a part of the fuel bill but is normally included in bills for all electric service in the home. However, when separate metering is provided for the heat pump, the bill for electricity does include such services.

One simple way in which compensation may be made for this factor is to increase the coefficient of performance by a small adjustment, possibly one or two-tenths of a point. If this is done, the effect of energy used for such auxiliary equipment is removed from the calculations and the relative costs of the three fuels will again be on a comparable basis.

The dial calculator provides an answer to two fundamental questions about heat pump operating costs and is intended as an aid in selling.

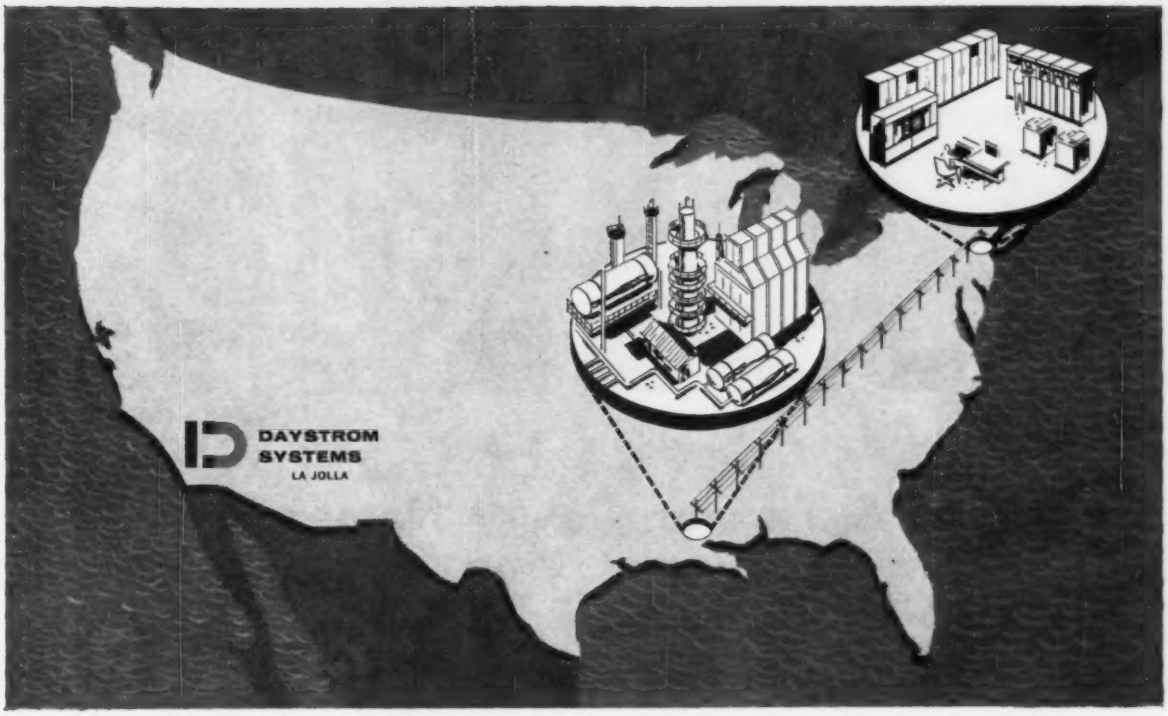
In the final analysis, it may be said that the calculator may not settle an argument but it will provide a fair basis for starting the discussion.

Edison Electric Institute Has New Sales Course

Edison Electric Institute has drawn up a five-part electric appliance sales training course featuring a section on basic selling principles which reviews the basic tenants of salesmanship presented in a previous EEI sales training course.

Other sections deal with selling the electric range, electric dryer, electric water heater, and the refrigerator-freezer.

The course has a set of 50 charts, salesman's manuals and leader's guides for each subject, and two acetate blackboards. Price $99.50. For additional details write: Edison Electric Institute, 750 Third Avenue, New York 17, N. Y.



Now...in addition to on-line computer systems

Operating and test data reduction via telephone link utilizing any computer facility

The new Daystrom TPR Scanning System represents a revolutionary approach with vast implications where there are requirements for immediate or continuous computer analysis of plant operating or test data. The availability of this new tool will influence industry's plans in a number of important areas, which include process studies, experimental test work in the military and nuclear areas, and testing for performance guarantees.

For the first time, the TPR (tape programmed raw) data scanner makes it possible and practical to link a test or operational plant facility directly to any computer in the country for instant computation of data. This is made possible by the utilization of standard telephone communication services, and permits stationing of all engineering and computer programming personnel at the project site, where all phases of the work may be handled.

The importance of this development is brought into sharp focus by the almost non-existence of computer facilities at actual plant or test sites. The utilization of telephone circuits completely circumvents this problem since it makes little difference whether the computer facility to be used is located in an adjoining building, company headquarters or at a rental facility. Distance represents no problem other than nominal telephone service charges.

Telephone communication of this type is a practical reality in the business machine field and is being used every day by leading companies for inventory control, accounting and other purposes. The Daystrom TPR Data Scanner is the first system that has been specifically designed to handle the problems involved in gathering large amounts of analog data peculiar to plant and test facility operation.

The TPR Data Scanner's feature of tape programming provides unlimited flexibility. This permits unrestricted application of the equipment to various types of facilities even though they may be completely different in nature.

Typical of the unequalled performance specifications are 0.1% accuracy at the 99% confidence level, together with extremely high signal to noise ratio at scanning rates up to 40 variables per second. 100% solid state circuitry and full parity checking are incorporated. Input channels may be as few as 100 or as many as 6000.

For further information, write or telephone Daystrom Systems, Dept. A-123, Miramar Road, La Jolla, Calif. GLencourt 4-0421.

Typical 2000 point system delivered to a major nuclear propulsion test facility.

DAYSTROM SYSTEMS
DIVISION OF DAYSTROM, INC.
Reliable computer control systems

LUCEY

ROLFS

TRUE

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American & Foreign Power Names New VPs

Four new vice presidents have been appointed by American & Foreign Power Co. They are: Richard A. Lucey, William J. Rolfs, John G. True, and William S. Nydorf.

Lucey joined Electric Bond & Share Co in 1927. Since then he has been directly associated with the Ecuadorean and Caribbean affiliates of American & Foreign Power. In 1956 he was named assistant coordinator of operations, and last year was promoted to coordinator.

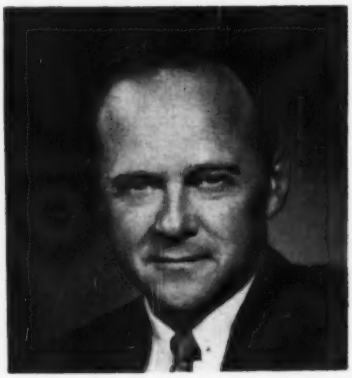
Rolfs joined the Electric Bond & Share System in 1927. For 18 years he was with its Nebraska Power Co affiliate, now the Omaha Public Power District. In 1945, he joined Ebasco International Corp as rate sponsor, and in 1957 was named coordinator of operations.

True joined EIC in 1945 as sponsor engineer for A&FP's Brazilian affiliates and for 13 years has spent considerable time with operating companies in South America.

Nydorf joined EIC in 1950.

As vice president he will continue to head the client utility financing department.

Larsen Named VP-Research



Dr. Finn J. Larsen has been named to the newly created post of vice president in charge of research for Minneapolis-Honeywell Regulator Co.

As corporate vice president he will continue to direct activities of Honeywell's central research laboratories in Minneapolis and, in addition, will provide research program guidance for all company divisions on a corporate-wide basis.

Dr. Larsen joined Honeywell in 1948 and had been director of research since 1953.

Leib Promoted to VP at Copperweld Steel

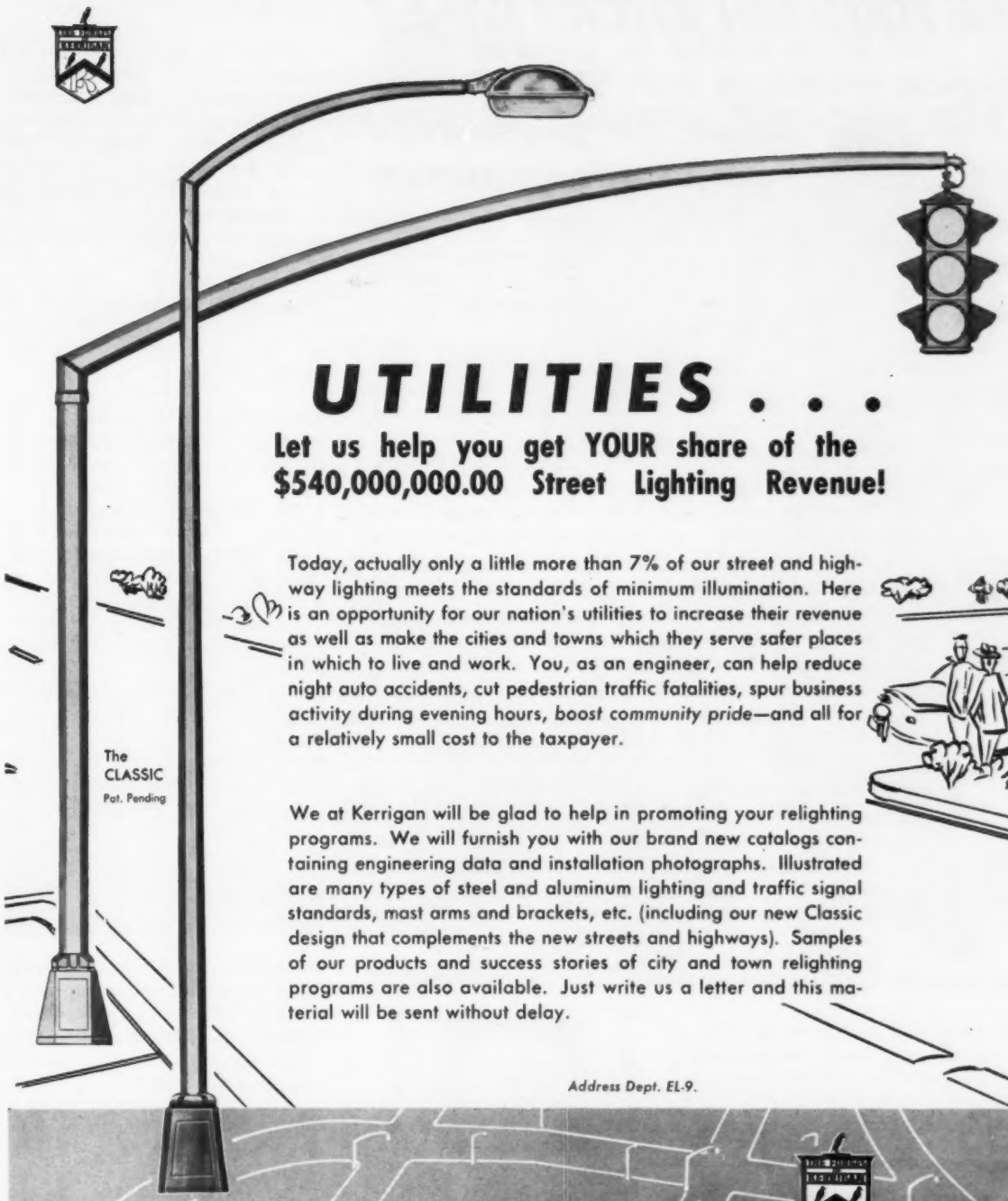
F. E. Leib has been promoted to vice president in charge of the Wire and Cable Division of Copperweld Steel Co. He succeeds the late William W. Ege.

Prior to his new assignment, Leib was general manager of sales of the division. Before that, he was chief electrical engineer.

He has also served as assistant manager of sales, and for several years was Copperweld's representative in Washington, D. C.

Leib has been active in the electric power and communication fields for the past 33 years, gathering wide administrative, sales and engineering experience.

(*More News About People on page* 98)



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Let us help you get YOUR share of the $540,000,000.00 Street Lighting Revenue!

Today, actually only a little more than 7% of our street and highway lighting meets the standards of minimum illumination. Here is an opportunity for our nation's utilities to increase their revenue as well as make the cities and towns which they serve safer places in which to live and work. You, as an engineer, can help reduce night auto accidents, cut pedestrian traffic fatalities, spur business activity during evening hours, *boost community pride*—and all for a relatively small cost to the taxpayer.

We at Kerrigan will be glad to help in promoting your relighting programs. We will furnish you with our brand new catalogs containing engineering data and installation photographs. Illustrated are many types of steel and aluminum lighting and traffic signal standards, mast arms and brackets, etc. (including our new Classic design that complements the new streets and highways). Samples of our products and success stories of city and town relighting programs are also available. Just write us a letter and this material will be sent without delay.

Address Dept. EL-9.

KERRIGAN
IRON WORKS COMPANY
Nashville, Tennessee

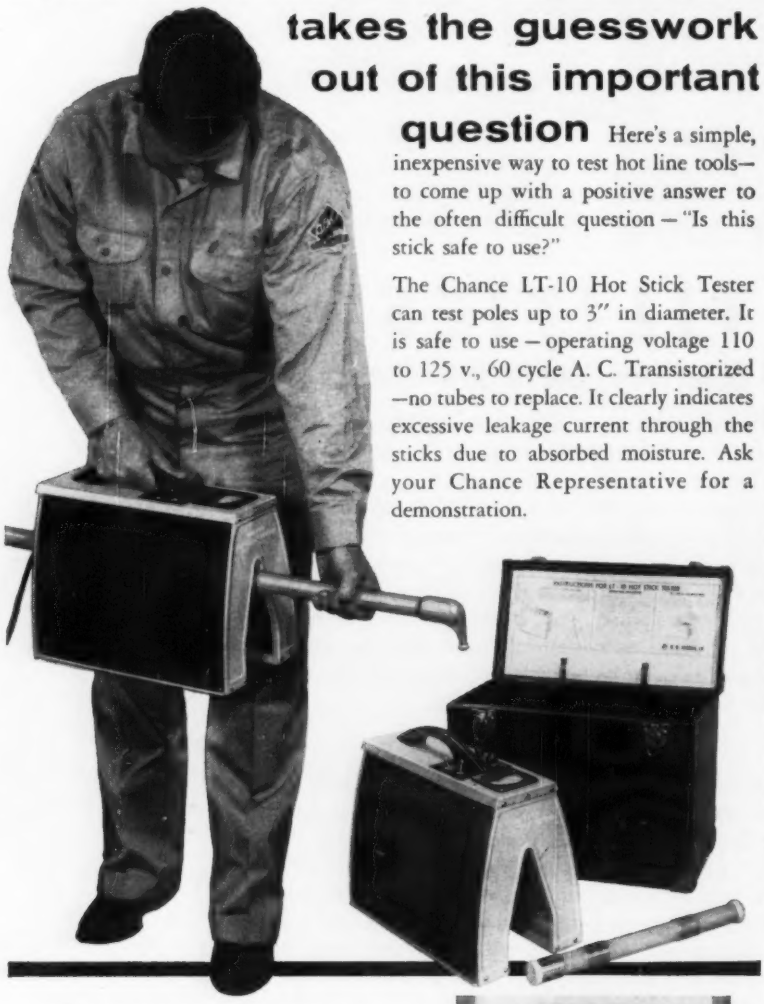
FOR BETTER LIGHTED STREETS AND HIGHWAYS THE *STANDARD* IS *KERRIGAN*

ARE YOUR HOT STICKS SAFE?

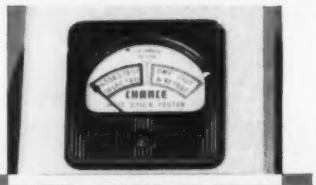
Chance Portable Hot Stick Tester takes the guesswork out of this important question

Here's a simple, inexpensive way to test hot line tools—to come up with a positive answer to the often difficult question—"Is this stick safe to use?"

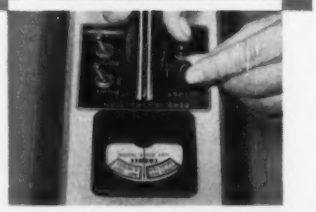
The Chance LT-10 Hot Stick Tester can test poles up to 3" in diameter. It is safe to use—operating voltage 110 to 125 v., 60 cycle A. C. Transistorized—no tubes to replace. It clearly indicates excessive leakage current through the sticks due to absorbed moisture. Ask your Chance Representative for a demonstration.



EASY TO OPERATE. A simple single dial shows whether the tool is safe to use or whether the tool should be dried and re-tested. A number of readings along the pole test every foot for safety.



EASY TO CALIBRATE. You can always be sure that the tester is accurately calibrated. Just press the "PUSH TO CALIBRATE" button and turn "ADJUST" knob until needle is centered on dial. A calibration standard is furnished with the unit for positive double-checking.



ABC INDUSTRIES

A. B. CHANCE CO.

CENTRALIA, MISSOURI

A. B. Chance Co. of Canada, Ltd., Toronto

CH59-16

PERSONAL BRIEFS

American & Foreign Power Co elected three new members to its board of directors: **John T. Kimball,** executive vice president of American & Foreign Power; **Frank L. Snell,** senior partner in the law firm of Snell & Wilmer, Phoenix, Ariz.; and **A. Thomas Taylor,** chairman of the board of International Packers Ltd., Chicago, Ill.

Walker Lee Cisler, president of Detroit Edison Co, was elected to head the American Society of Mechanical Engineers.

Georgia Power Co promoted five engineers recently: **Judson C. Greene** was appointed assistant division superintendent in Athens. **J. R. Pinkerton** replaced him as Augusta district superintendent. **L. P. Allred,** Athens district engineer, will succeed Pinkerton as Americus district superintendent. **W. H. Hairston, Jr,** succeeds Allred as Athens district engineer. **Joe J. Cordova** succeeds Hairston as Athens division transmission engineer. Company has also promoted **William J. Arnold, Jr,** to superintendent of the Atlanta division underground department. **B. E. Duncan** succeeds him as assistant superintendent.

Pacific Power & Light Co appointed **Reis Leming, Stan Walker,** and **William H. Mitchell** commercial representatives.

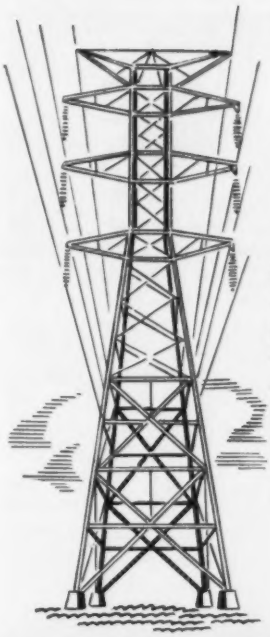
W. M. Larkin of Gulf States Utilities Co has been made system supervisor of industrial sales in Beaumont. **Edwards G. Hodges** will replace Larkin as supervisor of industrial sales in Lake Charles.

Herbert T. Blood joined Commonwealth Services, Inc, as an insurance consultant.

South Carolina Generating Co named **George L. Dibble,** manager of production and transmission, to the board of directors.

Floyd W. Lewis was appointed assistant to the president of New Orleans Public Service Co.

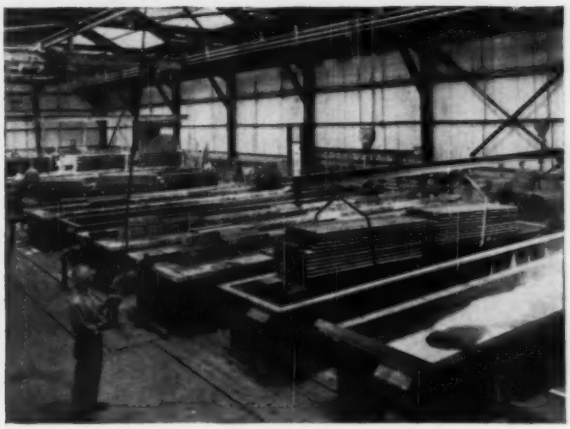
C. P. Smith has retired as assistant treasurer of the Georgia Power Co.



STEEL TOWERS
a Bethlehem Specialty

SKILLED ENGINEERS plan production of your towers and switchyard structures. Their detail drawings assure accurate, efficient fabricating. They tell our shopmen exactly where to punch and shear . . . to within ½ inch! Takes good men and good tools to do this kind of job.

RACK PUNCHES (shown here) as well as tandem and cluster punches are among the *specialized* equipment necessary. Holes must be accurate in position and size—they can't be reamed after galvanizing. There's all the difference in the world between tower work and ordinary structural fabricating.



GALVANIZING protects the steel from corrosion. The pieces are thoroughly cleaned, pickled, immersed in an electrically controlled zinc bath, then quenched. We do our own galvanizing, of course. All three Bethlehem tower shops are equipped with the latest word in galvanizing facilities.

FINISHED STEEL is carefully sorted in the shipping yards. You receive each individual tower "package," including fasteners, ready for speedy erection in the field. Our tower-fabricating works at Leetsdale, Pa. (near Pittsburgh), South San Francisco, Calif., and Seattle, Wash., are strategically located to fill your tower and switchyard requirements. May we quote on your next job? Please contact the Bethlehem sales office nearest you.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

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Insulating and Cable-Pulling

COMPOUNDS

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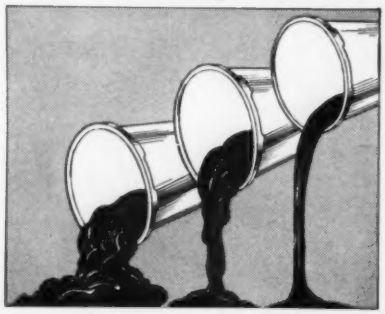

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NEW 3/4-ton Pull-A-Way

Added to WRIGHT TYPE "C" LINE!

FOUR SIZES • ¾, 1½, 3 and 6 Tons

FEATURES

- Lubricated for life
- Hooks are drop-forged
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- Chain sheaves of drop-forged alloy steel
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New 3/4-ton model
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ACCO

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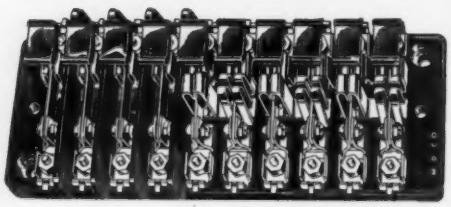
Wright Hoist Division
AMERICAN CHAIN & CABLE

York, Pa., Bridgeport, Conn.



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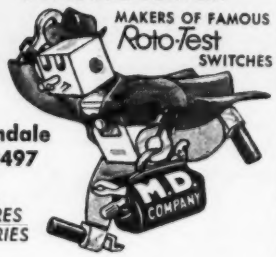
IMMEDIATE DELIVERY

MAKERS OF FAMOUS Roto-Test SWITCHES



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SALES ASSIGNMENTS

REPRESENTATIVES

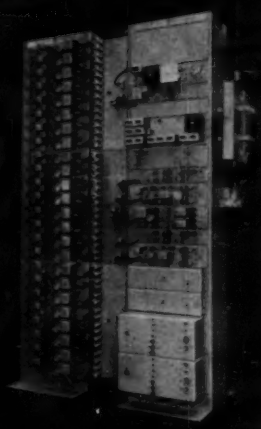
RT&E Corp has made these appointments as sales representatives: Walter L. Lassen for the state of Montana and part of Wyoming and he will be located at 703 Custer St., Billings, Mont.; John Breaux for the state of Tennessee and part of Georgia and he will be located at 1842 Sylvan Ridge, S. W., Atlanta, Ga., and W. M. Dusenberry for selected accounts in the southwest.

D. S. MacCorkle, Inc, appointed the following as sales agents: Jay C. Gates, 2430 Central Parkway, Cincinnati 14, Ohio, to cover the state of Kentucky and southern Ohio; J. R. A. Hobson, Jr, 601 East Franklin St., Richmond, Va to cover the state of Virginia; William A. Horning, 902 Friedel Ave., Vancouver, Wash., to cover states of Washington, Oregon, Idaho, and Montana; M. R. Gowing, O. G. Industries, Inc, 1414 N. E. 16th Ave., Fort Lauderdale, Fla., to cover southern Florida; F. C. Ohlander, 222 West Oak St., Wheaton, Ill., to cover Illinois, northeast portion of Indiana, northeast portion of Iowa, and the southwest portion of Wisconsin; E. A. Thornwell, Inc, 1537 Howell Mill Road, N. W., Atlanta 18, Ga., to cover states of Georgia, Alabama and the northwest end of Florida; I. Weinstock, 31 Cooper Square, New York, N. Y., export agent, and George A. Wright, 1211 Roosevelt Building, Indianapolis, Ind., to cover state of Indiana with the exception of the northeast portion.

Measurements Division of McGraw-Edison Co appointed F. Y. Gates Co for the Rocky Mt. area, and H. E. Ransford Co for the Pittsburgh area, as regional sales representatives. Gates will cover Arizona, New Mexico, Wyoming, Colorado, Utah, southern Idaho, and El Paso County. Ransford will cover western Pennsylvania and the state of West Virginia.

Jae & Meyer Co, Inc, appointed sales and engineering representatives for the complete line of Electromode equipment and all electric space heating systems. Company is located at 519 South Fifth Ave., Mount Vernon, N. Y.

GENERAL ELECTRIC NOW OFFERS THE ONLY COMPLETE MICROWAVE LINE



2 kmc
6 kmc
time division
frequency division
now available

By adding 6 KMC equipment to its 2 KMC line, General Electric now offers the first and only complete line of microwave in the industry.

Proved Reliability

General Electric microwave equipment has earned an outstanding reputation for dependability. Southern Colorado Power Company, for example, enjoyed a reliability factor of 99.99 percent in 18,360 hours of operation using General Electric 2 KMC equipment. This same reliability is engineered and built into the new 6 KMC product.

More Flexibility for Systems Designers

Microwave systems designers now have a wider choice than ever before *from one unbiased source.* They not only can choose between 2 and 6 KMC equipment, but also between time and frequency division multiplexing. Thus systems planners can pick the exact product or combination of products to suit their needs, providing from one to 120 voice channels for communication or control.

For complete information on General Electric microwave, contact your G-E communications consultant, listed under "Radio Communication Equipment" in the Yellow Pages. Or write General Electric Company, Communication Products Dept., 999-7, Mountain View Road, Lynchburg, Va.

Progress Is Our Most Important Product

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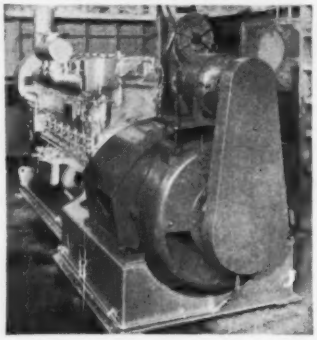
Big Savings from Manufacturer's price

300 KW GM DIESEL ENGINE GENERATOR SETS



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This is a job that requires skill, knowledge and ambition, and offers real opportunity for advancement in compensation and responsibilities.

Please send resume to Mr. John F. Konrad, Manager of Investments. All replies confidential.

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Excellent opportunity in relay test section of Massachusetts utility. Good knowledge of electronics a necessity, E.E. degree helpful. Salary commensurate with experience. Write resume of experience, education, personal data, and salary requirements. All held in strict confidence.

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With 3 or more years experience in electrical design for buildings, including lighting, distribution, wiring, etc. Permanent employment with well-established midwestern consulting engineering firm. Write giving personal resume and required salary.

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TRANSFORMERS

QU	KVA	MFR	VOLTAGE
1	12000	G.E.	115,000—46,000 L.T.C.
3	3000	G.E.	69,000—4340, 3 Ph.
3	833	West.	66,000—6900/11950
3	500	G.E.	66,000/33,000-2300/13200
3	500	Wagner	69,000—460
4	333	West.	67,000—7200
1	2500	Mol.	44,000—2400/4160, 3 Ph.
2	2500	Wagner	45,800/22,900—4160Y, 3 Ph.
3	500	G.E.	44,000—2400/4160
3	200	West.	44,000—480
1	5000	West.	34,500—13750/6875, 3 Ph.
2	3000	Upgf.	34,750—4160, 3 Ph.
2	1500	G.E.	34,400—2520, 3 Ph.
3	1000	A.C.	34,650/11,500—2300
3	500	Mol.	34,500—2300/4600
3	200	A.C.	34,500—2400/7200/12470Y
2	2500	Wagner	22,900—4160/2400, 3 Ph.
2	1500	G.E.	23,000—2400/4800, 3 Ph.
1	7500	A.C.	13,800—2400, 3 Ph.
2	3000	G.E.	13,800—2640, 3 Ph.
1	2500	G.E.	13,800—2400, Unit Sub.
3	667	Kuhl.	13,800—480
1	600	Stand.	13,200—2300, 3 Ph.
1	450	Penna.	13,200—2400, 3 Ph. Askarel
3	333	G.E.	13,200/22,800Y—2420/4190Y
3	333	Mol.	7,200/12,470—2400/4160
1	500	Kuhl.	4800—480, 3 Ph.
3	100	G.E.	4800—120/240
1	1000	A.C.	2400/4160—240, 3 Ph.
3	400	G.E.	2300/4,000—230/460

FEEDER REGULATORS—OUTDOOR

1	750	G.E.	360 A. 12,000 V. 3 Ph. STEP
1	500	G.E.	694 A. 4,160 V. 3 Ph. STEP
1	375	G.E.	50.2A. 34,500 V. 3 Ph. STEP
1	250	A.C.	601 A. 2,400 V. 3 Ph. STEP
3	96	G.E.	200/400A. 2400 V. 1 Ph. IND
8	36	West.	150/300A. 2400 V. 1 Ph. IND

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Experience in design of transmission, distribution and sub-station facilities. Opening with large midwestern consulting firm, providing excellent working conditions. Please reply, with resume, to:

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POSITIONS VACANT

Wanted—Graduate Electrical Engineers— Electric Utility in North Jersey area. Some experience in transmission and distribution desired. Please answer giving education, experience and salary expected. P-2345, Electrical World.

Application and Sales Engineer—Excellent future with leading manufacturer in the electrical field. Applicant should be 28-40 years of age, E.E. graduate, with distribution engineering, construction, or sales experience. Position involves 50% to 60% travel. Salary commensurate with qualifications. Send detailed resume of experience, recent photo. All information will be held in strict confidence. P-2379, Electrical World.

Superintendent of Metering. Graduate EE with minimum 6 years experience residential, commercial and industrial watthour meter testing and maintenance with operating utility. Ability to test, adjust and repair watthour meters, organize and train test personnel, formulate test procedures, establish record system, and specify and purchase meters, test equipment and spare parts is essential. Location Middle East. Salary $16,000 to $18,000 with two year contract and other benefits. P-2440, Electrical World.

SELLING OPPORTUNITY OFFERED

Representative wanted for manufacturer of street lighting equipment pole line specialties. Full particulars. RW-9821, Electrical World.

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Position Wanted: Superintendent of large High-pressure power plant desires to relocate. Technical education, excellent background, 23 years experience. PW-2500, Electrical World.

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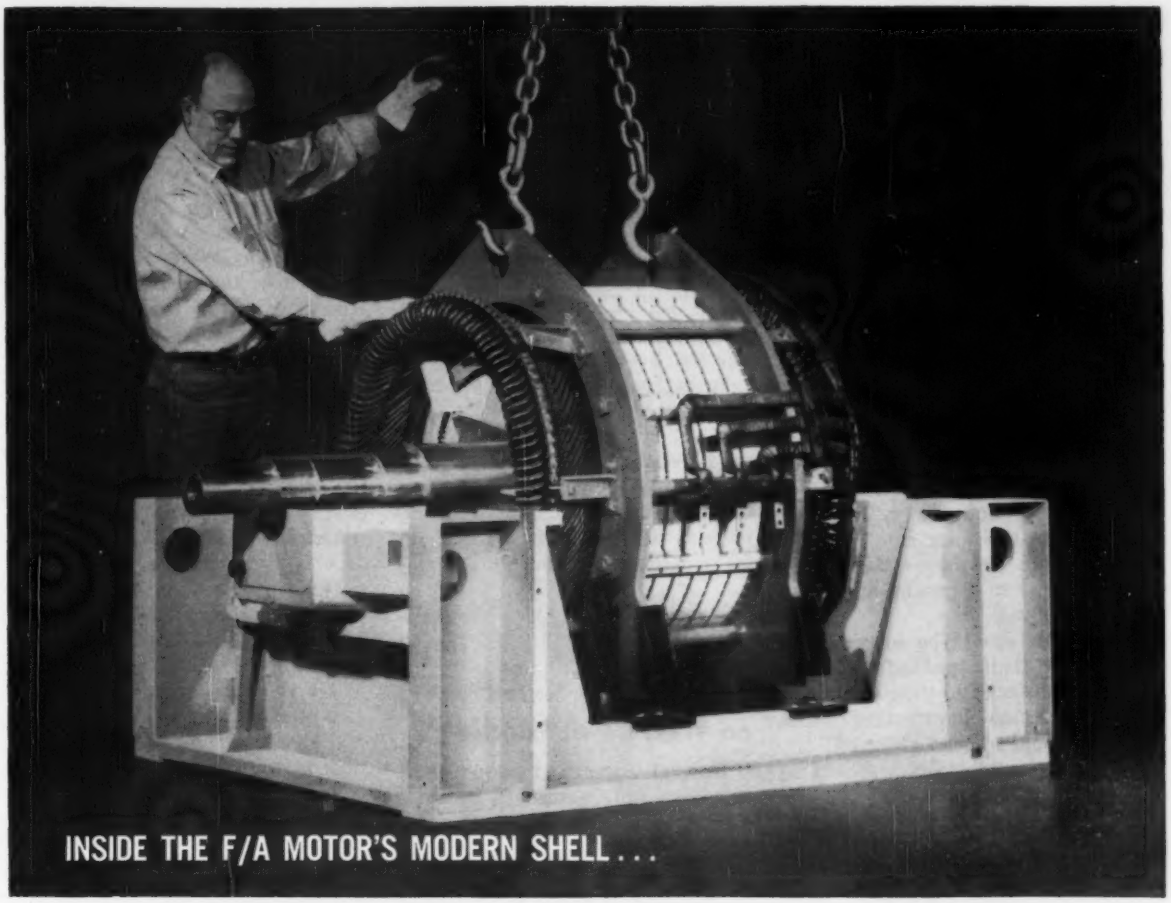

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Consider what these proved performance extras can mean in down time and maintenance savings alone. For more specific test data, call your Westinghouse representative, or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa. J-15013

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Pole Treatment Cuts Line Costs (*Continued from page* 65)

latter should make decisions at the pole as to whether it has enough sound timber for treatment. The criteria for his decision, however, should be furnished him by the company.

A general program of pole preservation will probably be most conviently carried on by areas. While working in any area, information should be secured to complete the utility's pole records, particularly, the date branded on the pole. The apparent condition of every pole in the area will be observed. The contractor's foremen are in a position to be very helpful to the line department of the utility, for they "live" with the poles.

Here are provisions that might be written into a ground-line treatment contract:

1. Poles should be inspected to determine their age and the presence of obstacles to their treatment. Other specific information about poles should also be reported.

2. Only suitable poles should be treated.

3. Poles that are hazards should be promptly reported by telephone to the utility company.

4. Excavation should be to a depth of 18 in. below ground level, the hole affording a 6-in. lateral clearance at the bottom and a 12-in. one at the top. The treated surface should extend 6 in. above the ground line and to the pole's bottom.

5. All loose, weathered wood should be chipped away to at least 6 in. above ground level, and all external decay removed from the treatment zone. Loose chips and decayed pieces must be removed from the hole and the surrounding ground.

6. The location and extent of heart rot, or internal decay, should be determined by sounding and boring.

7. The conditions of treated and rejected poles should be reported.

In general, the first treatment at 15 years' life has been found reasonable. Inspections will determine the scheduling of subsequent treatments. It is believed that the useful life of a pole can be thus extended 50 to 100% beyond the 30-year life expectancy.

Formal Study Slated on West Coast Intertie

Federal, State, and power representatives have agreed to launch a formal study into proposals for a Pacific Northwest-California high voltage intertie. Such a study was requested by a recent resolution of the Senate Interior and Insular Affairs Committee.

Officials of the Bonneville Power Administration, Bureau of Reclamation, and Federal Power Commission met in Portland, Ore., July 23 with representatives of the governors of Oregon, Washington, Montana, and California and with major public and private power groups.

Agreement was reached on the scope of the study, basic assumptions, criteria, and timing. The following time table for preliminary reports was set up:

September 1—Power loads and resources through 1985 for Pacific Northwest, northern California, Calif-Oregon Power Co, southern California, and British Columbia. Resources will be analyzed on basis of the major water control plan of the Corps of Engineers 308 report and a modification with possible Canadian storage and development.

September 15—Coordination of BPA's system with the Central Valley project (Calif.) including available secondary power study.

October 15—National defense aspects of the intertie.

October 15—Transmission interconnection alternatives on the basis of delivery of salable energy, coordination of federal systems, alternative voltages and costs.

September 1 to October 15—Several reports dealing with consideration of construction of fuel requirements in California, effects of geographical extension of BPA's service area, and total investment costs.

November 15—Deadline for preliminary draft of the entire study, to be distributed to the consulting groups for review and comment.

December 15—Final report with comments presented to entire group.

December 30—Presentation to the Senate Committee on Interior and Insular Affairs.

Chairman of the group is William A. Pearl, chief of BPA.

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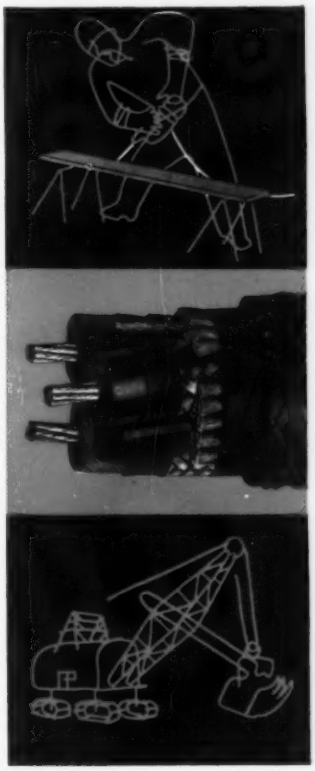

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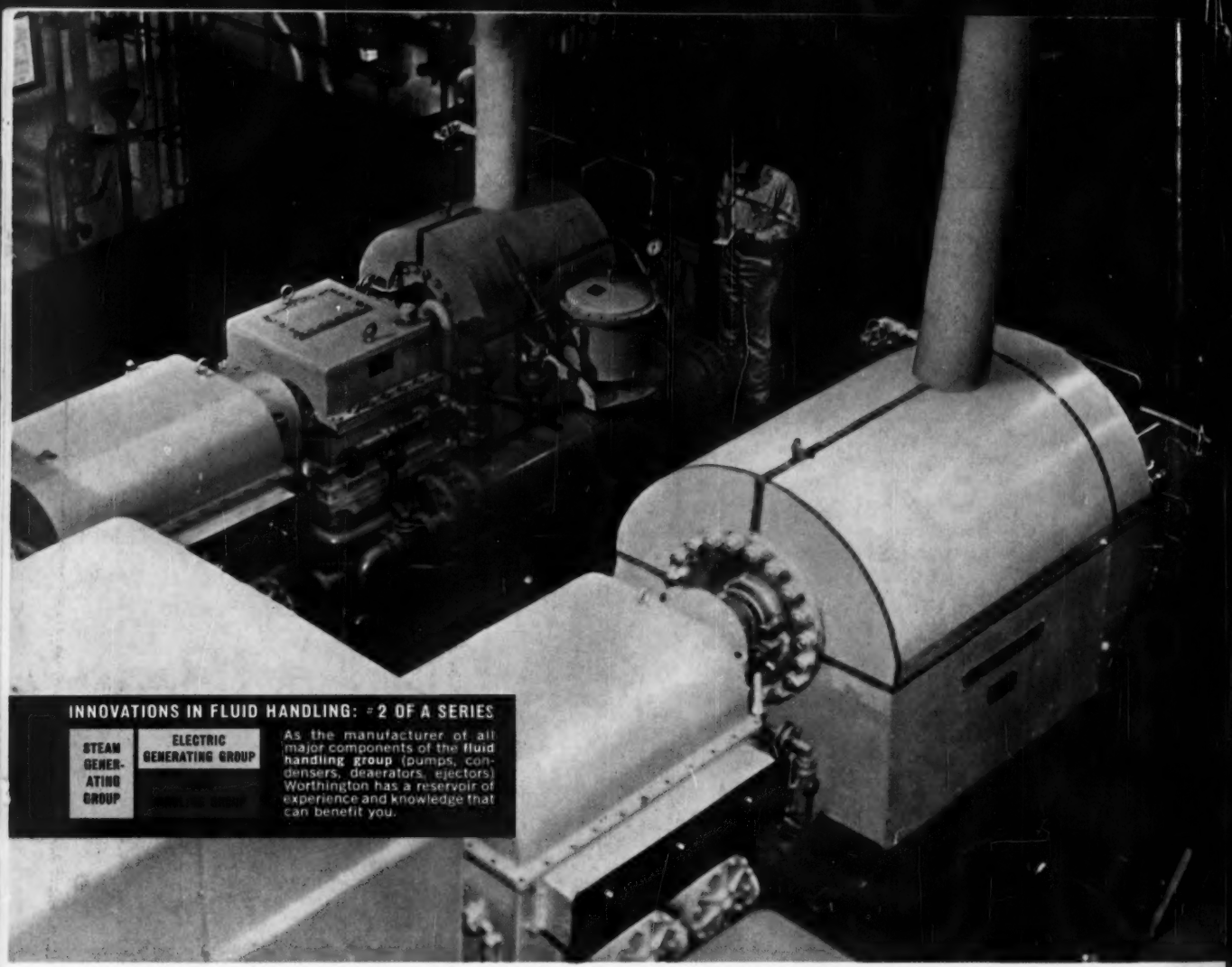
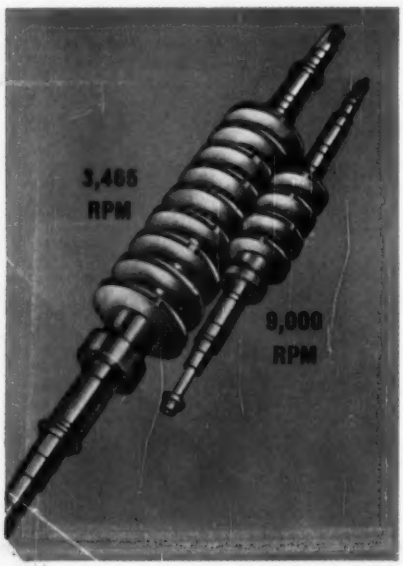

INNOVATIONS IN FLUID HANDLING: #2 OF A SERIES
STEAM GENERATING GROUP
ELECTRIC GENERATING GROUP
As the manufacturer of all major components of the fluid handling group (pumps, condensers, deaerators, ejectors) Worthington has a reservoir of experience and knowledge that can benefit you.

This photo measures pump progress. Here are two boiler feed pumps with duplicate pressure and capacity ratings. On the right is a unit of conventional speed; the other is the fastest pump of its type in service, running at 9,000 rpm. Smaller size is dramatically evident.



Comparison of rotors. The rotors used in the two 4-stage pumps above are shown here. The rotor used in the high speed pump will have one-third the deflection of the 9-stage rotor in the conventional unit.

PUMP PARADOX

High speed boiler feed pumps are several times as fast, yet actually more reliable

In modern power plants, the demand for higher efficiency has led to higher operating pressures and, therefore, higher heads for boiler feed pumps. This is a critical area for the fluid handling group. Can you obtain these higher heads without sacrificing reliability?

Worthington has proved that you can. By going to speeds twice as fast (and even greater) Worthington drastically reduces shaft spans required. This cuts shaft deflection to a fraction of its former value. Since pump wear, and hence pump life, is directly related to shaft deflection, the high speed pump is actually more reliable than a conventional unit of the same capacity.

Experience in the field has proved the wisdom of Worthington's design philosophy. More than 39 Worthington high speed pumps are now installed and 21 are on order. Speeds range from 6,500 to 9,000 rpm. If necessary, Worthington sees no reason why speeds shouldn't go even higher, without departing from experience-proved construction principles.

Reducing shaft deflection through shorter shaft span is only one way that Worthington increases boiler feed pump reliability. Other ways include larger shaft diameters, liberal clearances, shrunk on impellers, metal-to-metal pressure joints, a special method for measuring internal wear, and anti-oil-whip bearings.

High speed boiler feed pumps are one example of Worthington's leadership in the fluid handling area. Through the years Worthington has made many contributions to the solution of power plant problems. Why not put this progressive "know how" to work on your next plant? Worthington Corp., Harrison, N. J. In Canada: Worthington (Canada) Ltd., Brantford, Ontario.

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